

DECEMBER 1953

HUGO GERNSBACH, Editor

Science-fiction *plus*

preview of the future

*complete
short novel*

THE TRIGGERED DIMENSION

by HARRY BATES

(author of "Death of a Sensitive.")



THE TRANS-HUMAN

by Murray Leinster



BITTER END

by Eric Frank Russell



THE VAMPIRATE

(a novelette)

by James H. Schmitz



many other stories



35¢

STATUS OF SCIENCE-FICTION

Snob appeal or mass appeal?

by HUGO GERNSBACH

IN A COUNTRY as highly industrialized as the United States, where every other person has a fair smattering of science, one would assume that the reading public, of science-fiction literature, would number tens of millions. Actually, this is far from the fact.

Science-Fiction, to be sure, has a large following, but it is split up and scattered over a large expanse of diverse media. These, in the main, comprise science-fiction newspaper strips, comics, motion pictures, radio and television programs, books, and science-fiction magazines.

The latter are at the bottom of the heap as far as mass penetration is concerned. This seems surprising at first glance, but upon analysis is not. The sad fact is that the circulation of today's representative science-fiction magazine is below 100,000—most of them averaging around 60,000. There are over thirty science-fiction magazines in the U.S. today, but they duplicate each other greatly in readership. Even if there was only a 50% duplication, there still would be only 900,000 readers—which is small, as circulations go in the U.S.

Here we must also add the phenomenon of the *central concrete core* of science-fiction—the all important, all penetrating Fan, the amateur—that delightful congregation of *aficionados*, that vociferous and voluble voice of all science-fictiondom.

Numbering fewer than 25,000, they are nevertheless a power to reckon with. They have their regular—and highly serious—conventions, their meetings and lectures by the hundreds, and there is nothing in science-fiction that does not have their complete attention. Every new S-F movie, broadcast, book, magazine, is avidly covered and discussed in every aspect. And when it comes to magazines, a copy of every edition is bought—some fans buying as many as 20 different S-F magazines a month, borrowing from fellow fans those which they themselves don't buy.

Their "Letters to the Editor," are legion. The average fan letter is voluminous and frank, down to the inner nucleus. The fan praises the stories he likes with enthusiasm, but throws corrosive acid in driving streams on the stories which—to him—don't pass muster. The S-F fan knows far more about S-F authors, artists, editors and everything that goes into the magazines than do the publishers themselves. And why shouldn't they? Few publishers ever have the necessary

time to read as much science-fiction over as long a time as has the arduous S-F fan.

From all this it becomes clear why the S-F fan sets the pace for science-fiction today. He not only influences the author, but the editor and publisher as well. He—and only he—is the main body *critique* today. All this is quite as it should be—because it helps to drive the art to higher accomplishments.

Unfortunately, also, the best and most assiduous critics in the world often unwittingly generate forces which in time may destroy the very edifice which they helped so laboriously to rear.

Modern science-fiction today tends to gravitate more and more into the realm of the esoteric and sophisticated literature, to the exclusion of all other types. It is as if music were to go entirely symphonic to the exclusion of all popular and other types. The great danger for science-fiction is that its generative source—its supply of authors—is so meager. Good S-F authors are few, extremely few. Most of them have become esoteric—"high brow." They and their confrères disdain the "popular" story—they call it "corny," "dated," "passé."

Nevertheless, we note with interest that when a publisher recently brought out a popular priced quarterly which had only "antiquated" reprints of science-fiction of the late 20's, it sold far better than other similar efforts. The lesson would seem to be plain from this and other examples: there is a fine market for *crêpes Suzette*, but an infinitely larger one for good ice cream.

If the young and budding S-F author—unspoiled by the prevailing snob-appeal—will look around carefully, he will note that all S-F media—with the exception of science-fiction magazines—*always* cater to the masses. They rarely have snob-appeal, the story is nearly always simple, understandable to the masses, young and old.

Yes, motion picture producers buy the rights for esoteric S-F books, but their scenarists carefully rewrite the whole story *into simple language* so that it is not over the heads of the masses. Radio and television scripts follow practically the same formula. So do newspaper strips and the comics.

At present, science-fiction literature is in its decline—deservedly so. The masses are revolting against the snob dictum "Let 'em eat cake!" They're ravenous for vitalizing plain bread!

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MALIGNANT WHITE**

by

Murray Leinster

The stand-out feature of our next issue will be a complete short novel by the master science-fiction story teller, Murray Leinster. *The Malignant White* is a dramatic story of space-adventure, with the flavor and verve that gives good science-fiction its special appeal, and physical and philosophical aspects that add richness to the tale.

Leinster has taken some of the most provocative elements of space travel and combined them to form a solid and satisfying tale of interplanetary travel. Shipwreck on an unknown world; relics of a once mighty civilization; evidence that intelligent menace still persists; strange creatures in the Weinbaum tradition, and most baffling of all, the incredible mystery of *The Malignant White*. All these elements, combined with adroit craftsmanship add up to royal science-fiction entertainment.

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SCIENCE-FICTION+ has made it a consistent policy to keep many of its outstanding stories and features a surprise. You will be pleased when you open the next issue of SCIENCE-FICTION+ and note the choice science-fiction which has been compiled to please the discriminating reader.

Science-fiction^{plus}

preview of the future

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will be paid by this magazine for each Short-Short Science-Fiction Story. These stories must be real science-fiction, not fantasy, and should not run over 1,000 words. The Short-Short + will occupy one full page.



This design, symbolizing science-fiction, is displayed with all stories of a serious scientific-technical trend. Such stories contain new scientific ideas which are certain to be realized in the future.

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(Illustrated by Virgil Finlay)

WHEN Johnny was five years old, he didn't know he was a human being. On his fifth birthday he was living in an eight-sided tower under a yellow sky, and he played and had his lessons in a most improbably-shaped walled enclosure, and he thought he was a very, very happy Khasr child. He didn't know that the Khasr had played a very dirty trick on him by not killing him when they massacred his parents and all the other colonists on Llandu II, and he didn't suspect that every act of kindness they showed him afterward was part of an even dirtier trick. His playmates were especially chosen Khasr, but he didn't know that, either. When he waked in the morning, his playmates waked too. Johnny slept on a soft cushion, but his playmates slept dangling from the bars of a cage-like contraption, hanging by the claws on each of their eight legs. When he'd had his bath they came crawling about him, saying "Good-morning Johnny," in human voices that they'd carefully learned to copy from human vision-records. Johnny beamed at them and zestfully asked what they'd play that day.

They had eight legs, those Khasr, and barrel-shaped bodies, and compared to their expressions an Earthian tarantula looks positively benevolent, but Johnny didn't know. He didn't remember when he'd had human parents. He'd been barely two when he was captured and carried away; the small colony his parents had lived in had been melted down to a lake of slag. There'd been elaborate conditioning work on Johnny, to make him able to stand the sight of Khasr. At first they used euphoric drugs to keep him from screaming with horror when they appeared. Then he associated euphoria with the sight of them. At three he believed implicitly that he was a Khasr. At five he thought he was a happy Khasr child.

On his fifth birthday they first showed him pictures of men. His tutors explained carefully that here were some new animals that he should learn about. Since he was going to grow up to be the bravest of all Khasr, he needed to learn about the creatures he would hunt and kill. So—and here his crawling Khasr playmates made a human-sounding chorus of agreement—so today Johnny would play at the killing of men.

And he did. He played according to Khasr traditions of the heroic. The Khasr were warlike and not nice people. When they discovered humans, and found that men were spreading all through the First Sector of the galaxy, they made war as a matter of course. But the Khasr tradition of a well-conducted war was one that their enemies didn't know anything about. Their idea of a glorious victory was a sneak-attack in which not a single one of the persons attacked had an instant's uneasiness before he was dead.

So when Johnny and his playmates played at killing humans, it wasn't hunting as human children would

human

by MURRAY LEINSTER

have played. It was strictly murder. But the slithering, clicking Khasr squealed gleefully (as they had learned to from vision-records of human children)—when Johnny turned a make-believe coagulator-beam on the foolish make-believe humans who had come out of a make-believe spaceship, and make-believe-killed every one before they knew there was a Khasr around.

It was a charming new game, this pastime that Johnny was taught on what happened to be his fifth birthday. Before the double suns set that afternoon, Johnny had slaughtered imaginary thousands of those monsters, men. He went to bed in happy exhaustion, beaming at the universe.

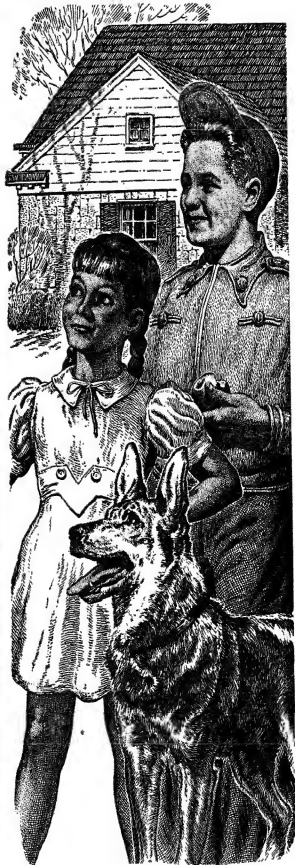
This was within a week or so of the Khasr massacre on the Mithran Worlds. At that time human colonies were still not using detectors. The official opinion was that the vanishing of spaceships without trace was due to pirates, and the small human colonies occasionally found burned down to slag were the victims of pirates too. There was an intensive hunt on for the people who supplied those imaginary pirates.

But the Mithran Worlds killings shattered that illusion. There were fifty thousand people on the innermost planet, nearly that many on the second, and a quarter-million on the third. When every human being on all three planets was murdered and incinerated with no clue to the murderers, the size of the atrocity proved it wasn't pirates. Human official minds change slowly, but it had to be admitted that somewhere there must be a race something like the Khasr, and that they must be found and exterminated. When this decision was arrived at, Johnny was not yet six.

At ten, he was not quite as happy as when he was younger. He'd noticed that he wasn't exactly like his playmates. They were as large as he was, but they had more legs, with claws on them, and stiff, furry hairs growing out of their exoskeletal shells. Johnny's two arms and two legs were smooth and hairless. He asked questions. His Khasr tutors told him sympathetically that his parents were traveling in a spaceship on which the monstrous creatures men had played a strange weapon. Because of that weapon he was not physically like other Khasr. But he was of a race of heroes, and when he grew up he would kill men by thousands and avenge the injury to himself and the insult to his race.

Johnny still believed he was a Khasr. But he had the psychology of a human boy. At ten years, a boy needs desperately to be exactly like everybody else. Denied this, Johnny acquired a personal blazing hatred for the race of men who had mutilated him. Ironically, while he hated mankind, he spoke only human speech. His companions and tutors spoke human speech to him. He didn't know there were different languages. But he proved there were different sorts of minds.

Somehow around his tenth birthday he invented a new way of playing at murder. Zestfully he showed



For many centuries, science, philosophy, and religion have concerned themselves with the problem of whether men are born good or bad. The reasonable man attributes importance to environment as well as heredity. Murray Leinster, ever-popular, veteran science-fiction author, considers in this story, the staggeringly diverse environments that must exist on an alien world. He selects one on which a small, Earthling boy has been raised, who has never seen the Earth, and does not know he is human. This provides the backdrop for a most thoughtful and moving story.



Murray Leinster first began writing science-fiction in 1914, and though he has since written every type of fiction, has sold to virtually every outstanding slick publication in America, and is listed in *Who's Who of America* for his literary achievement, he returns again and again to his first love, science-fiction. His high level of quality has made him an outstanding favorite in the field.

his crawling, stinking companions a new trick to kill men. He pretended that a make-believe spaceship was crippled, and left for the Khasr who pretended to be men to find. The make-believe men clustered around the imaginary ship. And Johnny exploded an imaginary bomb to destroy them all. It was an entirely new device, because the Khasr tradition was not even to let an enemy know that they existed. To leave a decoy ship violated that tradition. But it was a splendid trick to kill men!

Johnny's tutors praised him extravagantly. But inside they must have winced, because men had just played that exact trick on the Khasr. Near Llandu IV, a decoy-ship had exploded in the very center of an investigating Khasr fleet. Humans had acquired fragments of six Khasr ships to study, so they could learn something about Khasr weapons. Humans thought like Johnny. They invented the same kind of devices, which Khasr could not imagine because of their traditions. The Khasr encouraged Johnny to think of more ways to kill humans. They had a better use for him later, but even now he could contrive ways to kill his fellows.

When he was thirteen, Johnny came up with a scheme for capturing a human ship intact. He'd never seen himself in a mirror—he didn't know mirrors existed—and he thought he was a Khasr, but he had the ingenuity of a human boy. Also he believed he had more reason to hate humans than anybody else. So he schemed a robot signaling device to be placed on some empty, useless world. It was harmless. But under the rocks, all about for miles, there would be placed radiation-bombs. A human ship would detect the signal and trace it. It would land to investigate the robot transmitter. And the radiation-bombs would go off. They would not shift rock or destroy anything. They would simply emit unthinkable quantities of lethal radiation—subatomic particles—which would kill any living thing nearby.

Again Johnny's tutors praised him. But inside, they must have hated him with a poisonous fury. Because humans had just played that trick, too! On the barren outermost world of Knuth, they'd set up just such a booby-trap. It had worked. Humans had wiped out the crews of two first-class space-battleships and had the ships, intact, with all the newest and most perfect weapons and instruments of the Khasr.

They raged. The Khasr loved glory—of their own particular variety—and to be out-murdered, out-sneaked, out-tricked by any other race was intolerable! The ultimate of humiliation was that non-Khasr creatures had looked upon Khasr—dead, but still Khasr—and lived to tell about it. The Khasr nation was filled with a sort of screaming fury of shame and frustration of men who had beaten them at their own game.

So matters progressed. Normally, Johnny was to have been used when he was a grown man. But he was almost fourteen, now, and the Khasr couldn't wait any longer. His tutors began to feed him carefully calculated bits of information. They delicately fanned his hatred of humankind to high pitch. And within a month of his fourteenth birthday Johnny thought he'd invented the

idea for which he'd been captured in the first place, and for which he'd been nurtured and trained.

At that, he improved it considerably on the idea the Khasr had had in the first place.

When he outlined the scheme—he trembled with eagerness—the Khasr seemed to be astonished at its brilliance. But, they objected, he was the only Khasr who could carry it out. It would call for special study on his part. It would even require, they told him—and the Khasr seemed to shudder—plastic operations to make him resemble men physically. He would have to pass for a human being!

Of course, they added hastily, plastic surgery improved all the time. When his task was done they could restore him to his present appearance. In fact, though they hadn't told him before, they now told him they believed they could graft on his body the four extra legs he didn't have because of what men had done to him when he was young. Yes. If Johnny could carry out his stratagem, and destroy the very nucleus of the unspeakably revolting human race, he would be the greatest hero of the Khasr race!

And the Khasr were really pleased. Their original scheme had seemed plausible. Johnny's improvements seemed to doom the human race to extermination. With Earth wiped out, the scattered human colonies could be murdered one by one.

So during the next two or three months furry horrors of Khasr came and lectured to Johnny on the manners and customs of human beings, using human speech because Johnny didn't know there was any other. Other Khasr set up phoney surgical apparatus, and anesthetized Johnny, and later told him they had changed his appearance. Presently they showed him pictures of himself. He went sick. He looked human! When they thought he could stand the sight, they gave him a mirror looted from an Earth colony before its destruction, and set up vision-records so Johnny could see how humans walked and acted and their ways of using clothing, and how they used instruments to eat with.

Johnny learned. He hated it. He was bitterly ashamed. He hated mankind the more because he had to learn to pass for human. One thing that was bitter humiliation was that he could no longer wear the plastic sheaths, suitably furry, which they had provided for him to hide his soft white skin and let him look as much like a normal Khasr as possible. When Khasr saw him at the task of trying to cease to imitate their stilt-legged gait, and wearing human garments, and acting like the humans in the vision-records, the feeling of degradation was intolerable. But he ground his teeth and went on. He would be the greatest hero in the Khasr race!

He was all burning impatience after the Battle of Andromeda Two. After that, no true Khasr would hesitate at anything!

The battle was the aftermath of the human capture of two Khasr battleships intact. The humans had studied them and refitted their fleets with instruments to detect the Khasr drive. They'd found out how to nullify the Khasr coagulator-field, and they'd adapted a few new devices to work efficiently upon the technical apparatus the Khasr used.

And ultimately human ships discovered a Khasr murder-fleet near Andromeda Two. What seemed a suicide-ship dove into it. The Khasr delayed to murder it. And that suicide-ship had a very nice blow-out beam which burned out the Khasr interspace coils so they couldn't get away in faster-than-light escape. They had to stand and fight. And they didn't know how to fight, but only murder. Yet no Khasr could imagine surrender.

It wasn't really a battle but a very satisfying massacre, with the Khasr on the receiving end for a change. Not one ship, not one Khasr got away. Yet the Khasr did blow up most of their ships before the humans could board them.

WITHIN a month, Johnny took off from the Khasr planet. He carried with him the foaming hatred of the Khasr race. They didn't show that they hated Johnny too, of course. There was a field turned black—the normal vegetation was purple, but it was hidden by the monstrous shapes gathered there—with a crowd of furry monsters assembled to see him off. They had carefully been trained to make human-seeming noises, and they cheered Johnny. And he rose toward the yellow sky with an inspiring memory of their clawed legs waving in farewell.

He began what he believed would be the most splendid war-feat of the Khasr race.

He could have been right.

The interspace field folded about his spaceship in the peculiarly deliberate manner of interspace fields. The stars and the twin suns of the Khasr planet gave place to a view of mere gray chaos which is all the viewplates show when a ship is in faster-than-light drive. And Johnny was alone. It was his first trip in space, but the ship—a huge one—was very nearly automatic. He didn't need to worry about astronavigation. He had only to pass for a human being, and the ship would be landed on Earth as a trophy, and then Johnny would press one small button and that would be that. So he believed.

For the best part of a day he simply exulted in the splendid feat which he, a Khasr, would perform for the Khasr race. But then a very peculiar fact turned up. Not only was this his first trip in space. It was the first time he had ever been alone so long as he could remember. The Khasr had never left him in solitude. They were busy supervising his mind: conditioning him to remember that he was a Khasr and that he hated men.

But he suddenly discovered that he was lonely. He'd never known the sensation before.

Days passed. His ship went on and on through that nothingness in which speed beyond the speed of light is achieved. The ship's transmitter sent out a purposely crude imitation of a human recognition-signal as it went past the stars and planets of the void. The signal went back into normal space, of course, and was picked up. It was analyzed. Eyebrows raised at its characteristics. Humans have eyebrows. Khasr do not.

A message went on ahead of him, faster than light and even faster than Johnny's ship. The message said, "*A human recognition-signal, unofficial, is heading for Earth from a Khasr ship. Get him!*"

Action was taken upon that signal. In interspace a ship can gain speed or it can decelerate, but it must always be gaining kinetic energy or losing it. If it tries to achieve stasis it pops back into normal space again. It is not wholesome to pop back into normal space at several light-speeds. So nobody tried to intercept Johnny in interspace. Ships leaped to meet him where he would come out.

And Johnny grew lonely. He had never been alone for as much as five minutes. Now there was nobody to talk to and nothing to do for days. For weeks. For more weeks.

There was nothing to do. The ship was automatic. There were no vision-records, because it was a Khasr ship and human ones didn't belong in it, and Khasr ones would have had Khasr speech on them—which might have caused Johnny to think. There were no

books. For the same reason. It was solitary confinement. It was worse. It was solitary confinement in a ship in that unreality which is not a cosmos, which is not actuality, which is not anything at all and which is called interspace. Technically, Johnny and his ship were unrealities. And Johnny was alone.

After the first week—his ears ringing, dizzy with the silence about him—he tapped the recognition-signal. Then he heard, over and over and over again, the message it broadcast.

"*Human ship!*" said the signal desperately. "*Heading for Earth! Prisoner escaping from Khasr!*"

There was never any answer. Naturally! But Johnny listened to it while loneliness ate at his vitals. A Khasr doesn't get lonely. A human does. Johnny went through an agonizing human experience, wholly inconsistent with his conviction that he was a Khasr. He had solitary confinement without even the break of a daily visit by a jailer. A week would rack the nerves of an adult human. A month would drive him mad. Fortunately, Johnny was fourteen years old and tougher than a human adult in such matters. But he had two months and a week and two days of it. . . . He was not a normal Khasr when the ship began to decelerate. He wasn't even an artificial one.

WHEN the warning-drum boomed for pop-out—the Khasr didn't like the sound of bells—Johnny was hanging on to sanity by the knowledge that presently he would have to talk to men and persuade them that he also was human. He would talk to someone—something—that was alive. He would have the company of the monstrosities he had come to destroy. And he craved company so desperately that he actually wanted even human company.

Which the Khasr, of course, had been completely unable to anticipate.

With a leisurely unfolding of the interspace field, the Khasr ship popped back into normal space. There was a pale-yellow sun not far away—bright enough almost to have a disc. There was all the magnificence of the galaxy for Johnny to stare at, after chaos. There were the thousands of millions of stars of every imaginable color against a background of velvety black.

Johnny stared, trembling. And then his communicator growled, while his recognition-signal still babbled its message.

"*You in the Khasr ship,*" said a sardonic voice. "*Any last words, or do we blast you now?*"

Johnny gasped. Then he saw the sleek Earthship, swimming grimly toward him through emptiness. He stabbed the communicator-button and moved in range.

"*I—escaped from the Khasr,*" he gasped. "*I—I—Please keep on talking!*"

If the Khasr had heard him, they would have been wonderfully pleased. It was the one truly convincing thing he could have said. He heard a reflective whistle, and then a voice speaking aside from the microphone in the Earthship.

"*Look at this! How good are those Khasr at making robots? Or is it really human?*"

Johnny sweated. Robots do not sweat. Nor Khasr. He gulped:

"*I've been—alone since I left. S—somebody please come on board!*"

That was part of the original scheme. The Khasr had hoped originally only for a suicidal dash of their ship into collision with Earth, with Johnny using his human form and voice to delude those who would have intercepted him. And he wouldn't know it was suicide. But this was better. Johnny had planned it. But he meant it differently now!

He trembled when the space-lock opened. He almost broke down when a human figure came out into the Khasr ship, blaster ready, and looked at him with suspicious eyes. He was gladder to see this human being than he'd ever been to see a Khasr. But he'd never been alone before. The Khasr couldn't imagine what loneliness would do to Johnny.

They had not imagined how Johnny, being just fourteen years old, would affect the humans who found him, either.

They took him off the Khasr ship—but he remembered enough to make them promise to let him come back to it—and a human crew moved it toward Earth. And Johnny was among mankind. He told them the story that had been planned, of course. He'd been captured as a baby, he said, and raised by the Khasr for study. He didn't know how true that was. And he said that three human prisoners had been brought in to the Khasr planet, and he talked to them, and the four of them made plans to steal a Khasr ship and get away. But when the three prisoners made their break they were killed, so he had to make the break alone. He had three authentic names to give, as those of the prisoners. His whole story was a masterpiece of synthesis by the Khasr psychologists.

The only trouble was that it fell to pieces instantly it was checked—though Johnny didn't know it. Space messages went among the stars, and men who knew the three supposed prisoners were found. Johnny couldn't describe them. He didn't know the nicknames they called each other. His story was plainly a lie from beginning to end.

Also, a normal examination of the Khasr ship revealed that its whole substance was a highly unstable allotrope, which, however, was not radioactive. Yet when triggered it would explode in total annihilation of its own substance—not in fission explosion nor in fusion, but in annihilation—and they found the trigger. It would have set off the three-thousand-ton ship-bomb when it touched Earth, whether Johnny did anything or not. In fact, it was known from almost the first instant that Johnny was on a mission to destroy humankind, and that he was lying and still trying to carry it out.

The trouble was, of course, that he still believed himself a Khasr. The battleship was an alien environment to him. When they put him in a cabin by himself, it had four walls instead of eight. The bunk was on a shelf, not a soft cushion on the floor, and there was no sleeping-frame from which Khasr could have dangled in slumber by the hooks on their legs. Johnny didn't know that the cabin was a place to sleep in. He stayed in it because he was put there—the Khasr had not trained him to do anything but what he was told—and when someone came for him many hours later, he was shaking and panicky because of the strangeness. He was anguished when left alone.

They assigned a midshipman to introduce him to human ways. The midshipman's name was Mike, and he was red-haired and freckled, and had apparently been assigned to the battleship to get in the way of other people. He was not much older than Johnny, and he had no purpose in life except the blithe enjoyment of each moment as it came. He was very good for Johnny.

Tolerantly, he instructed Johnny in the eating and sleeping manners and customs of human beings. It was difficult for him to imagine anybody knowing more than he did, about anything, but he did ask some questions about the Khasr. However, he grew bored when Johnny essayed to answer him. He dis-

missed the Khasr as "spiders"—a new word to Johnny—and reverted to his normal preoccupations. They led to trouble. Specifically, there was a purloining of ship's edible stores, and Johnny was in the trouble with him. But Johnny blindly told the truth when questioned, because the Khasr had no prejudice against tattletales. Mike did, though. Scornfully, he let Johnny know. Johnny had been surrounded by contempt and hatred all his life, but it had been hidden from him. Now, when Mike despised him, Johnny's loneliness was almost hysterical. When Mike angrily pushed him away, Johnny wildly and unskillfully hit back.

A fight began, but Johnny did not know how to fight, and Mike regarded him in open-mouthed amazement. Then he began to grasp the degree of Johnny's abysmal ignorance. In sudden large tolerance he instructed Johnny in the fine art of fist-fighting. Johnny acquired black eyes but he had Mike's tentative respect because he kept at the job of learning. One day out from Earth, he gave Mike a black eye. Then his throat went dry in apprehension.

"That's the way to do it!" said Mike warmly. "You're doing good!" Then he went to wheedle a poultice from the ship's cook.

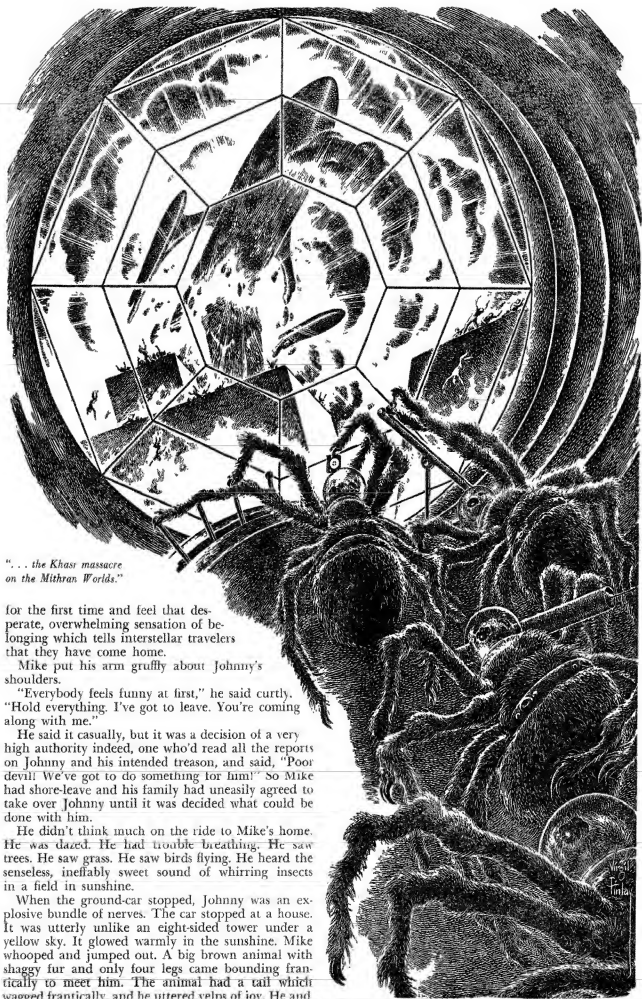
WHEN the vast bulk of Earth loomed out the ship's ports, Johnny shivered. Soon, he believed, he would be let back into the ship he'd brought, and he would press a certain stud, and all this ghastly race of human beings would be destroyed without anybody having felt an instant's uneasiness. Then he would go back to his fellow-Khasr.

But he shivered at the prospect. He had been two months and a week and two days absolutely alone in the Khasr ship. At fourteen years old, a human doesn't like to be alone. He had companionship among humans. Mike was his friend. He was older and felt much wiser and he treated Johnny with the consciously superior tolerance of an older brother. But he was a friend, and Johnny had never had a friend before. He'd had only officially appointed playmates and tutors. He yearned over Mike.

When the ground swelled up toward the ship he was tense and his throat ached. He saw the sky change to a lucent blue. He saw the mottled Earth below him take on tints which were not the colors of the vegetation to which he was accustomed. He saw clouds, . . .

He was deathly pale when he walked out of the battleship. He moved rather like a sleepwalker. He saw a blue sky instead of a yellow one, and the grass was green instead of purplish. And it looked right! He'd never dreamed of a world like this. He'd never imagined the smells that greeted his nostrils. He was shaken; he was stunned—and he felt an enormous welcoming in every molecule of the ground beneath him and every touch of air against his cheek. When he heard bird-songs, his throat swelled as if it would lock tight and strangle him. And he hadn't the least idea why. When he tried to ask Mike, humbly, his lips trembled and he couldn't form the words. There were even tears in his eyes and he was bitterly ashamed.

But Mike knew what was the matter. After all, Earth has been the home of human beings for hundreds of thousands of years. Every look and sound and smell of Earth has been part of the human heritage for thousands of generations. The feel of Earth is in the very germ-plasm of humanity. No other place, anywhere, can ever look wholly right to human eyes. So Johnny wasn't the first human being to see Earth



"... the Khasr massacre
on the Mithran Worlds."

for the first time and feel that desperate, overwhelming sensation of belonging which tells interstellar travelers that they have come home.

Mike put his arm gruffly about Johnny's shoulders.

"Everybody feels funny at first," he said curtly. "Hold everything. I've got to leave. You're coming along with me."

He said it casually, but it was a decision of a very high authority indeed, one who'd read all the reports on Johnny and his intended treason, and said, "Poor devil! We've got to do something for him!" So Mike had shore-leave and his family had uneasily agreed to take over Johnny until it was decided what could be done with him.

He didn't think much on the ride to Mike's home. He was dazed. He had trouble breathing. He saw trees. He saw grass. He saw birds flying. He heard the senseless, ineffably sweet sound of whirring insects in a field in sunshine.

When the ground-car stopped, Johnny was an explosive bundle of nerves. The car stopped at a house. It was utterly unlike an eight-sided tower under a yellow sky. It glowed warmly in the sunshine. Mike whooped and jumped out. A big brown animal with shaggy fur and only four legs came bounding frantically to meet him. The animal had a tail which wagged frantically, and he uttered yelps of joy. He and

Mike rolled on the ground in a panting, squirming heap because they were glad to be together again. Then the door of the house opened and a woman and a girl came out. Johnny had never seen a woman before. Or a girl.

The girl's hair was red, like Mike's, and her eyes were intensely, tremendously blue. Mike gasped from the ground where he tumbled with the dog:

"That's my sister Pat, and that's my mother, Johnny."

The girl Pat was younger than Mike. Younger than Johnny. But she put out her hand and—he'd been instructed—Johnny accepted it. He was trembling. Like the dog which was glad to see Mike. This girl who smiled at him. . . . Mike's mother smiling at him too. . . .

When Mike's mother put her arms around him, Johnny went all to pieces. But people who have been born on other planets often go all to pieces when they first set foot on Earth.

A CERTAIN uneasiness was felt about Johnny, of course. He'd been raised to believe he was a Khasr, and he'd come to Earth to destroy the human race on their behalf. But at Mike's home he was with Mike, who was his friend. And there was Pat, whom Johnny tried to learn to treat with the grandly superior yet kindly manner of Mike himself. But it was not always easy to play a part, however passionately Johnny might want to. He saw the sun set for the first time. He saw sunrise. He saw the stars from Earth's surface, and the full moon floating in the sky. Mike's dog made friends with him—and to someone who'd been raised to think himself a Khasr, that was an overwhelming experience. Johnny couldn't pretend about that. He saw the sea, and flowers blooming. He tried to conceal the effect of all these things upon him. He tried to mimic Mike's blithe irresponsibility. But Mike's sister Pat grinned wickedly at him when he tried to use Mike's own very manner. She seemed to realize that Johnny was having, at fourteen—two years older than herself—all the experiences most people have as babies, when they're practically wasted. She bossed him a little, and he tried to patronize her.

Johnny was very happy, in Mike's house and treated as if he were Mike's brother, even by Mike's sister and his dog.

But there were moments when the unobtrusively watching adults had their doubts. There was the night when Pat came in the room where Johnny sweated to learn a game—and carefully think in terms of fair-play as humans thought of it and not as Khasr grandeur. Pat had a natural-history book in her hand.

"Johnny!" she said firmly, "I just thought! You've never seen spiders. Have you? Like this?"

Johnny looked at the page. There was a picture. Mike's mother glanced casually to see. She tensed a little. The picture was of a *Mygale Hentzi*—the American tarantula. It was a good-sized picture, magnified. The creature was eight-legged, with furry armor over its limbs. Its expression of implacable ferocity was shudder-inspiring. Johnny looked carefully.

"That looks like Tork," he said steadily. After a moment he added, "He raised me. He was my nurse. . . . my teacher."

Pat looked blankly. Mike cowered at her. She looked apprehensively at her mother. Johnny noticed. He swung about and looked up.

"I've never been allowed to go back to the ship I came on," he said quietly. "And nobody says anything about the Khasr to me. People have found out what the purpose of my voyage to Earth was and what

that ship was supposed to do, haven't they?"

Mike's mother drew her breath in sharply. She'd been advised to do what Johnny asked. She said matter-of-factly:

"Yes. They found out."

Johnny said thoughtfully:

"It would have killed everything. Animals. Birds. Dogs. Everything. You and Pat, too. And Mike."

Mike's mother nodded.

"I know," She repeated. "They found out."

Johnny turned back to his game. Then he glanced again at the page of the natural-history book—at the tarantula.

"That does look a lot like Tork," he observed. "My move?"

So there was something less than complete satisfaction about Johnny's future as a human being. There was unease.

NEXT day Pat showed Johnny some spiders. Mike went looking for a web of one of the big yellow-banded garden ones, which weave bands of silk in the centers of their snares. But Pat led the way competently to the back of the ground-car shed. She expertly turned over stones and stirred up dried leaves. Then she said:

"There, Johnny! There's a spider!"

Mike's mother was listening. Nobody knew exactly what was going on in Johnny's head, and it might be deplorable. He'd been raised to think he was a Khasr, and while he acted normally, now. . . .

"That's like the picture," she heard Johnny say. "Sure! He doesn't look like Tork, though. He looks like the lecturer who came to teach me how to act when I pretended to be human."

There was a sudden movement. Mike's mother heard Pat say:

"What'd you do that for? People say if you kill a spider it'll make it rain!"

Johnny said with satisfaction:

"I like when it rains. I like everything good on Earth." Then he said with a certain calm, masculine, brotherly generosity, "I can even stand you, Pat. You're a lot like Mike."

WITHIN minutes of that moment a spaceship popped out of overdrive a very long distance away.

It was, as it happened, the very same spaceship in which Johnny had spent two months, a week, and two days, on his journey to destroy the human race while he believed he was a Khasr. Humans had examined the ship and had taken samples of its material—which if properly triggered would detonate, not in atomic fission and not in atomic fusion, but in atomic annihilation—and they had put some extra equipment in it. They'd located the position of the Khasr planet by examining the automatic-control system that had guided the ship to Earth. But they'd put a robot pilot on board, to take over when this ship came back to normal space.

It popped-out in the Khasr solar system, traveling forty thousand miles a second. Its robot pilot made what turned out to be a very minor correction in its course. It sped for the Khasr home planet. At forty thousand miles a second, detectors are not much use. When a ship has to travel less than three seconds from pop-out to landing, they aren't any use at all.

They weren't, in this case. As a matter of fact, their attempt to report hadn't even been noticed when the ship from Earth touched the atmosphere of the Khasr planet.

So not a single one of the Khasr had even an instant's uneasiness before they all were dead. +

Intelligence factor

A Short-Short +

by CORWIN F. STICKNEY

FOR UNTOLD MILLENIA the virus mass had drifted over the arid wasteland, knowing that it was the only sentient life on the planet. Yet ceaselessly and tirelessly, driven by instinctive need, it searched for the perceptive host that did not exist. The dying world barely sustained the virus mass, the irreducible remnant of its life, and, inevitably, when all air and warmth were dissipated, death would come to both.

But a time came when the thin atmosphere was disrupted by shock waves and a blast of welcome heat. The virus mass drifted curiously toward the source of the disturbance, toward the cylinder of gleaming metal, towering in the desert. . . .

"Take it easy, Neville!" complained the puffing little biologist. He struggled with the catch of his helmet, secured it, and snapped on the battery-powered microphone. "I'm as anxious as you to set foot on solid ground, but Mars is no place to break a leg!"

The larger man grunted impatiently, spun the knob that opened the airlock, and stepped quickly through. When Wilmer was beside him he closed the lock and put a gauntleted hand on the outer-hull door. Pausing, Neville glanced amusedly at the rotund biologist, whose heavy breathing filled his earphones.

"With your *avoirduis*," he commented, "you could fall a mile and not worry. After you!"

An oval area in the gleaming cylinder swung outward, permitting the exit of the two suit-clad creatures who might or might not be suitable hosts to the virus that was unknown to them. The virus approached. However, the creatures proved unsuitable; their surfaces were entirely nonporous. The virus floated past the oval area just before it closed, and explored the interior surfaces of the ship. They, too, were nonporous.

Finding itself confined, the virus waited for a period that was inconsequential in its lifetime of waiting. Then the opening reappeared and the men entered.

"The planet is dead," muttered Wilmer, shedding his spacesuit. "Totally dead. What a letdown our report will be!"

Neville was equally depressed. "Yeah," he drily agreed. "There's hardly any point in testing with your pets. I wouldn't wish this place on my mother-in-law, much less Jackie and Jo-Jo."

At mention of his beloved monkeys, Wilmer's interest revived. "Oh, no," he said, starting toward their cage, "I must make the tests anyway. We have to learn—"

Neville looked up as Wilmer's voice became a strangled sound, saw his face turn green, his eyes roll wildly, saw him become violently sick and crumple to

the floor. Then Neville, staring, was swept by waves of nausea. The rocket compartment rotated dizzily about him as his kinesthetic centers went abruptly out of control. . . .

These two creatures *were* porous, after all! The virus mass had split and each half was surging through layer after layer of warm, pulsing tissue, hungrily seeking the vital centers where sustenance and fulfillment lay. Each perceived the nearness of its goal—and at almost the same instant each came to a frustrating, shocked halt.

These creatures were already virus-occupied!

Immediately the invaders unleashed furious attacks, attempting to envelop the resident viruses. But in neither case could the edge of surprise endure; in seconds each invader knew that its aroused foe was too numerous and too firmly entrenched.

There was nothing to do but withdraw.

Reunited, the virus evaluated its adversaries. Clearly, from their intraneural location, they too were symbiotic, performing the age-old function of stimulating and coordinating the host. But, judging from their hosts' limited capabilities, these symbiotes might be of a lower order, or else perhaps there was a chance they had become sluggish and inefficient. Perhaps unified assaults—first on the short, rounder host, whose occupant viruses had come nearer to defeat . . . but wait! There were *other* creatures here, other likely hosts.

The virus drifted toward the other pair of creatures. They somewhat resembled, in miniature, the two they had found to be occupied. The virus mass split. . . .

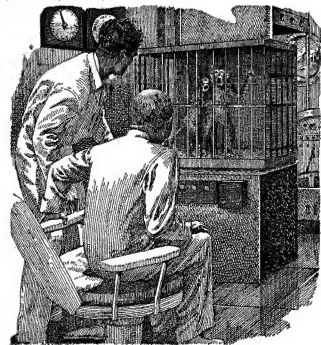
A moment ago to the monkeys it had seemed the most fascinating and natural pursuit in the world to be painstakingly grooming each other's body through the bars of their separate compartments. As the virus entered them, the game seemed to become pointless. It even seemed to Jackie and Jo-Jo to have become boring.

The brown rhesus monkeys drew apart and their eyes met in a long, intensely searching look, such as no two Macaca rhesus had ever before exchanged. . . .

Their hosts, each virus discerned, were imperfect in some ways. Compared to the first creatures—and the

(Continued on Page 30)

(Illustration by Lawrence)



"Look at your monks now, Wilmer."

Planted!

by FRANK M. ROBINSON

(Illustrations by Lawrence)

WE WERE UP IN CIC, running through a few practice plots, when Schulman picked up the object on the air search radar.

"Bogie! Zero three eight, fifty-five miles!"

Ensign Harry Piper turned on the light under the air plot and marked the position with a grease pencil. "You don't think we've been assigned an air cover, do you, Lieutenant?"

"It wasn't in the operations order," I said. "And besides, we're too far out." We wouldn't have rated one even if we had been closer to the coast, I thought. There was only our ship, the *Lorraine*, and the *Bollard Reefer*—two obsolete amphibious ships wallowing back across the Atlantic from an assignment with the Sixth Fleet.

Piper marked another position, then said quietly: "You should have picked it up further out, Schulman. That gear's supposed to have a range of four hundred miles."

Ensign Piper was my junior CIC officer, a somewhat brash youngster—great for discipline—just out of CIC school where they teach you with the latest equipment kept in topnotch condition. He wasn't used to the frustration of working on a reconverted cargo ship where the gear was left over from the last war and topnotch condition meant an overworked technician had blown the dust off the tubes a week ago.

"I reported it as soon as it came on the scope, sir. Should I call the technician?" Schulman's voice was filled with that certain mixture of contempt and respect that enlisted men reserve for officious ensigns.

"Don't bother," I said. "Just give us the plots as you get them."

"Yes sir, Lieutenant!"

Piper gave me a dirty look and went back to his plotting. Five minutes later he threw down his pencil and relaxed. "It's circling, just outside the fifty-mile mark."

I raised my eyebrows. "Circling? A thousand miles out over the Atlantic?"

"Take a look for yourself."

I watched him while he tracked the plane—or whatever it was—for five more minutes. It was circling, all right. Finally I said, "Keep an eye on it, Schulman," and turned to Piper. "Let's take a break."

We walked out to the small porch just aft of the radar shack and lit up. It was a chill, fall day, the sea a dull bottle-green. There was a faint scud of clouds on the horizon and I could tell by the wind that it wouldn't be long before the sea became choppy and foamed with white-caps. Below us, on the main deck, the deck apes were taking down the high-line over which we had just exchanged observers with the *Bollard Reefer*. The *Bollard* had been pulling steadily away for the last fifteen minutes and was now a good two thousand yards off our port bow.

"You know anything about this Ensign Daugherty?"

Piper asked casually.

Daugherty was one of the *Bollard's* observers. As a CIC officer, he had been assigned to Piper and myself,

Scientists with considerable standing, such as Dr. Donald H. Menzel, acting director of Harvard College Observatory, have gone to great pains to disprove every variety of visual and scientific sightings of flying "objects." Most discouraging to the layman is the fact that these "objects" apparently never land, and seem almost purposeless in their endless flying and maneuvering. Frank M. Robinson, who was a radar man in the Navy, and knows a little about radar saucer sightings, ponders this last thought in this unusual and provoking short story.

to watch us simulate air plotting and tracking that afternoon.

"He won't be rough. After all, one of us will be his observer tomorrow."

"I'm not worried," Piper lied. "Just curious."

He finished his cigarette in silence and dropped the butt down a deck drain. "Mark," he started, then hesitated. I glanced at him out of the corner of my eye and wondered what he was leading up to.

"Yeah?"

"What do you think we ought to do with Schulman?"

I thought to myself that if Piper had studied people as long as I had, he wouldn't be asking me that. "Why do you ask?"

"He's getting too wise."

Piper sensed that I didn't sympathize with him and changed the subject. "Everybody's getting discharged. Every time I turn around, somebody else is getting out." He spat over the railing and watched it disappear where the dull-green sea creamed against the hull. "When are you going home, Mark?"

"I don't know. One of these days." I walked away from the railing and turned up my collar against the chill sea air. I would be glad to go home, I thought. I had done as much as I was able, I had learned as much as I could.

"You got a family?" Piper asked, offhand.

"A wife and kid. They've both been pretty sick."

"Really loaded down with troubles, huh?"

Piper wasn't actually interested—he was just buttering up a superior officer.

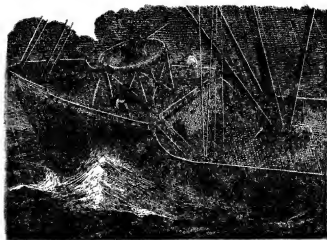
"Everybody has them."

Schulman's thick physique suddenly appeared in the hatchway. He looked worried.

"You want to take a look at this, Lieutenant? It doesn't look right."

We went back inside. Schulman had the sweep on the radar revolving at high speed so that the picture

"He raised his pistol and took aim, roaring in a bull voice . . ."



on the scope was almost continuous. I studied the blob of light that represented the target. It was creeping around in a circle; a circle that had a radius of fifty miles with our ship as the center. And it was moving much too fast.

I watched it a moment more, then slid into the operator's seat. "Plot these, Harry," I read off three sets of bearings and ranges. "What's the course and speed?"

"He's circling around us, fifty miles out. Speed I get is around twelve hundred."

"Do you know anything that has a speed of twelve hundred?" I asked in a brittle voice.

"There are experimental planes . . ."

"They're at Muroc," I said. "On the West Coast. There's nothing operational like that on this side."

"How about a foreign plane?"

"It would come as quite a shock to the CIA," I said.

"But I don't think it is. They wouldn't have been circling, for one thing, and they wouldn't be bothering with us for another."

I got up from the radar. "Here, you read them off and I'll plot."

I got twelve hundred, too. But my course was slightly different; the circle was getting smaller. I looked at Piper. He was sweating and I could feel my own sweat pop out under my arms and on my forehead.

I flicked the intercom switch to notify the bridge, and the Old Man gave me a blast for not reporting it sooner. Then he asked for a repeat on the speed and when I said twelve hundred, he got off a few choice words about incorrect plotting procedures by his junior officers and ordered that we go through it again. I didn't argue.

We had just started in once more when Piper looked up from the plotting board, frowning. "Where's Daugherty, Mark?"

Ensign Daugherty, I suddenly remembered, should have reported to CIC twenty minutes ago.

THE OLD MAN stormed into CIC when I reported the object at thirty miles and repeated the speed figure of twelve hundred.

"I thought you knew how to pilot, Evans!" Captain Woxvold was a big, weatherbeaten man with thirty years of service behind him; one of the few human beings I knew whose bark was bad enough but whose bite was even worse.

"That's how the figures come out, Captain," I said evenly.

He shouldered in beside me and watched while I plotted the next few positions. Finally he took a message blank, wrote on it, and handed it to me. "See that this gets out immediately." His voice had toned down a lot.

The message was to be sent to the Naval Operating Base at Norfolk; it described the incident and gave our position and time. I read it over the intercom to the radio shack and requested immediate action. They delayed in answering and when they did, the voice sounded close to hysteria.

"Something's wrong with the transmitter, sir. We can't raise Norfolk. We can't even raise the Bollard!"

"Try another transmitter!" I snapped.

"All equipment's gone dead, sir! We can't get out on anything!"

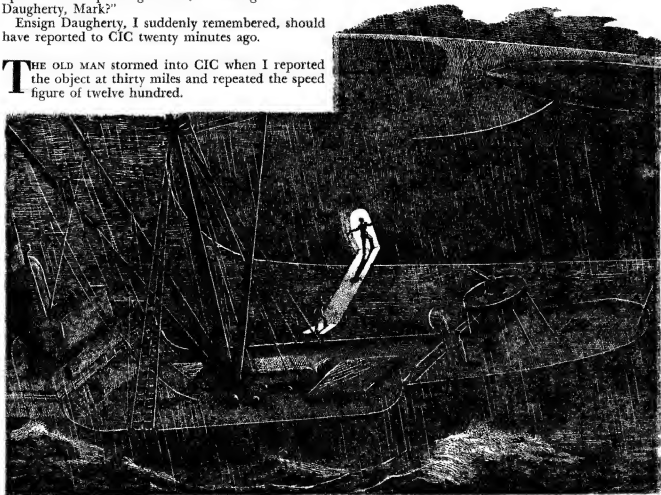
I notified the bridge of the communications breakdown, then turned back to the plotting board. "I can't imagine everything going haywire all at once," I muttered.

Piper wiped his sweating face with a big, khaki-colored handkerchief. "Maybe it isn't us. Maybe it's them. Some kind of field they could broadcast that would smother our communications."

"That's a little too fantastic," I said. "There's no plane on Earth that could do that."

"It doesn't have to be a plane."

"Careful, son," I grunted. "You're letting it run





Frank M. Robinson is one of the more promising new talents writing in the field of science-fiction currently, having successfully sold to most of the top markets. He has been anthologized frequently. He plans to interrupt his writing career temporarily for the sake of taking on additional higher education.

away with you." I wondered where Daugherty was.

We tracked the object in to twenty miles and a few minutes after that the lookout on the flying bridge picked it up. His voice over the intercom was a thin, nervous squeak.

"Plane off the starboard bow!"

There was a pause and I could imagine the lookout adjusting his binoculars for a better view.

"Can't identify. No wings . . ." The voice stuttered.

"No wings!"

I could almost hear the Captain and the Exec rush out of the wheelhouse to take a look for themselves. A moment later the brassy clanger of the GQ gong started, and the PA system crackled into life.

"General quarters, general quarters! All hands, man your battle stations! Gun crews, on the double!"

I took a chance and flipped the intercom switch again. "CIC does not recommend taking offensive action! Unknown object may not be hostile!"

Even over the intercom I could feel the coldness in the Old Man's voice. *"I'm in command of this ship, Mr. Evans!"*

I sagged back on my stool. The Captain was a member in good standing of the shoot-first-and-ask-questions-later school, and nothing I could say would change his mind.

The phone talker on the same circuit as the flying bridge repeated the lookout's words in a low, tense voice. *"Object circling ship, estimated range ten miles."*

I looked around at the faces in the darkened cabin and it came to me that they weren't separate faces, they were all one face. A white, frightened face, thin-lipped and shiny with sweat.

"Object closing! Range eight . . ."

I glanced at the radar screen just in time to see the blob of light quit circling and dart toward the center of the scope.

There was a thin, roaring sound overhead.

"All gun crews, fire at will!"

The forties aft of the superstructure broke into a roaring chatter and I could make out the thinner, more nervous sound of the twenties on the flying bridge. The blob of light on the scope had merged with the center spot; I watched it but it showed no sign of moving away when the firing started. I guessed that the gun crews were firing at almost point-blank range.

The firing kept up for a solid ten minutes, then gradually died away to an apprehensive silence. A moment later the Old Man came in, his face grey. He pointed to Schulman. "You! Open the port."

Schulman fumbled hastily with the dogs, then swung the metal cover plate back against the bulkhead. The Captain, Piper, and I crowded to the port.

The sea was choppy now. The clouds had closed in and it had started to rain, a fine drizzling mist that cut visibility down to practically nothing. The object we had tracked was hovering low over the water, barely a hundred yards away. No factory on Earth had turned out that squat, black shape, I thought. It bulked huge in the mist, more tubular than oval shaped, more menacing than I had imagined.

"The guns had no effect," the Captain said, "and we couldn't possibly have missed."

We watched the object pace alongside us, the gray light through the port revealing the calculating shrewdness in the Old Man's face and the glistening sweat on Piper's and my own. It seemed to be coming closer to the *Lorraine*, cautiously edging nearer to us through the mist.

"I wonder what it wants," the Captain mused.

It was Piper who first offered an answer.

"Watch its movements," he said slowly. "It looks like it was trying to match our course and speed. Reminds me a lot of the *Bollard* coming alongside this morning to send over observers."

The Captain mulled it over for a moment. The implication was fantastic, but so was the alien ship out there in the mist. He finally shook his head. "That's too far-fetched; they couldn't get away with anything like that."

"Maybe they're thinking of picking up one of their men," Piper insisted.

"That sounds fantastic, too," I said.

"I don't think so," Piper objected. "If there are other races besides ourselves in the Universe, then it's logical that they might have observers on Earth, isn't it?"

I couldn't argue with what I saw outside the port. He had a point. And what better place to plant them than in the Navy, and what more practical way of picking them up off a lonely cargo ship steaming across the Atlantic?

"We're assuming that the ship out there is dangerous," I said. "We could be wrong you know."

The old man looked at me as if I had just crawled out from under a rock. "I wouldn't give it odds, Evans. They could have approached us outright, you know. They didn't have to plant spies." He turned back to Piper. "If there's an observer on board, then he's dangerous to us—to everybody—because he knows too damned much. And that observer could be anybody, couldn't it?"

Piper had another inspiration. "Who's the most unusual member of the crew?" he asked slowly. "Who differs the most from the rest of us? Maybe he's given himself away by something he's done in the past, something that was out of character."

It was then that I remembered Daugherty.

"It doesn't have to be one of our men," I said. "The observer could be from the *Bollard*."

"Nice reasoning, except for one thing, Mr. Evans," the Captain said bitingly. "That alien vessel is following us, not the *Bollard*."

"We've got some of the *Bollard*'s men on board," I persisted. "Ensign Daugherty, for one. He's been missing for almost two hours."

"You should have told us sooner, Mr. Evans," the Captain said with a deceptive softness.

"We were pretty busy," I said stiffly. "We had a lot to do."

He decided not to press it. "You think he might be hiding on board, waiting for a chance to—transfer?"

"It's just a guess, but we can't afford to pass it up."

"Then we'll have to find him," the Old Man said grimly. "Soon."

Ensign Daugherty, report to CIC immediately!"

THE ECHOES from the PA system faded away, leaving myself and nine other men sweating in the gloom of CIC. I cracked my knuckles and counted the seconds to myself. The seconds mounted up to minutes but no shamefaced ensign showed up with a cock-

and-bull story about where he had been. Somehow, I knew that he wasn't going to.

"How do we find him if he's hiding on board?" Piper asked. "With everybody at GQ, below decks is practically deserted."

"There are the damage control parties," I said. "They'll have to go over the ship compartment by compartment, hold by hold."

Outside the port, I could see the black wet side of the alien ship hovering three feet away from the rail.

"How much of a menace do you think they are?" Piper asked suddenly.

"They're alien," I said shortly. "They're from Outside. They have a different set of values, a different code by which they live. Any alien race would differ radically from us, and that difference would make them the enemy—by definition."

Piper almost shivered. That was what he had expected me to say and I hadn't disappointed him.

"Daugherty will probably be lugging a satchel full of papers when he tries to make the transfer, won't he?"

I looked at him blankly. "Why?"

"He'll want to take plans back with him," Piper said thoughtfully. "Information about our science, machinery, that sort of thing."

The talker broke in and started detailing the report of damage-control party one.

"Number one hold clean. We're welding the hatches shut so that . . . nothing . . . can get out."

"Damage-control party two. After living quarters clear. Securing hatches."

I felt something cold and hard being pushed into my hands. I looked up. The captain was offering me a pistol. I hadn't even heard him come in.

"He might be hiding almost any place," the old man said in a tight voice. "Places where we might never think to look. But sooner or later he's going to have to make a break for it. Any suspicious movement on deck—shoot."

Piper opened the after hatch and we stationed ourselves stiffly on either side, watching the decks below. From where I stood I could make out the wire potato locker and the small sheet-metal movie projection booth almost directly beneath us. Further aft, the LCM's on deck obscured the view. My eyes caught the end of the king boom, snug against the superstructure, and followed it back to the big trestle mast. There were more M boats aft of the mast; the gun tubs for the forty-millimeter antiaircraft guns hid the fantail. There were a thousand places where Daugherty could hide.

But the only movement was that of the men in the gun tubs.

"Damage-control party three. Number five hold all right. We're stationing an armed guard at the hatch."

The Lorraine was beginning to pitch in the choppy sea; the huge shape beside it, half hidden in the misting rain, pitched with it, matching each tortuous twist of the ship with one of its own. Its distance from the rail didn't vary by more than a foot.

I glanced back in CIC. The men were still frozen at their GQ stations. Schulman was at the air-search radar, frantically scanning the screen for any companions to the black-hulled monster outside. The others were clustered about the plotting table, intently listening to the drone of the talker as he reported the progress of the damage-control parties combing the Lorraine rivet by rivet.

"Mark, look!"

Twenty feet away, just off the porch, a small section of the alien ship had slid back and a tongue of metal

projected out of the opening. A man on board the Lorraine could vault the porch rail and step onto the tongue with no difficulty at all.

The opening itself was blinding bright; I could see nothing beyond the curtain of light.

The minutes rolled by. My muscles ached from the tension.

"Damage-control party two. Engine room and shaft alley clear."

I braced myself against the roll of the ship and wiped the sweat off my palms, so I would have a better grip on the pistol. I looked across the hatch at Piper. He had lost all of his brashness now. He was breathing hard and his face was sweaty and a little green. The huge ship out there was the Unknown, the first contact with the Outside. What they were like, what they could, what they would do, he had no way of knowing. And hidden on board was one of their observers.

We had crouched by the open hatch for an hour, smelling the wet salt air and letting the chill wind dry the sweat on our faces, when the talker's voice suddenly exploded from a dull drone to an excited chatter.

"Damage-control party one. Ensign Daugherty found at bottom number two hold. Unconscious, leg broken. Bleeding internally. Send a corpsman immediately!"

A hatch can open over a darkened hold, I thought. A man who was unfamiliar with the ship could step through and plummet forty feet to the bottom. It's happened before. It had happened this time.

"The ship's still out there," Piper said thinly. "If it isn't Daugherty, then it must be somebody else on board."

I stared at him for a long moment, then made up my mind. "We'll have to plug that opening," I said with a grimace that I didn't feel.

Before Piper could object, I was racing across the porch, the heavy rain plastering my clothes against my skin. I heard somebody screaming curses behind me. It sounded like the Old Man but I didn't stop. I vaulted the rail. A second later I was balancing on the metal gangway of the alien ship.

There was a noise behind me. Piper had leaped over the railing and was running toward me. He still had his pistol in his hand.

I paused at the bright opening and turned to face him. I wanted to tell him that we had had it all wrong, that being an observer involved an impersonation not just for a few months, but one that covered years. That instead of being unusual, the observer would more than likely be the most average of average men, a man who was very much married and with very real troubles. And that such an observer would study people not to take away information as to what they did or what they made, but to gather the much more vital information as to how they lived and how they thought.

I stood there on the metal bridge, fighting to keep my balance against the wind and the roll and pitch of the ships. It was getting dark and the spattering rain almost hid Piper standing at the end of the bridge a few feet away.

He raised his pistol and took aim, roaring in a bull voice that was almost lost in the crashing of the sea.

"Where the hell do you think you're going, Lieutenant?"

I smiled, knowing that Piper was a prisoner of his own sense of discipline, that he couldn't bring himself to shoot his superior officer.

"I'm going home," I said as the brilliant light snapped off and the metal tongue of my trajectory-ship shut tight.

END OF REPORT

bitter end

by ERIC FRANK RUSSELL

THE SHIP dropped out of the sky with little noise other than that of its last braking blasts. Nor was it visibly spectacular because it came in the glare of the sun. Describing a shallow angle it neared the surface and let go a dozen bangs from its nose, hit sand with its belly and slid to a stop.

An expert eye could have seen at a glance that it was no ordinary moon-rocket such as flamed between Earth and satellite five times a week. It was longer, thinner, racier. Close inspection would have revealed it more worn, battered, and neglected than any moon-rocket was permitted to be.

Originally it had been golden but now most of the plating was scraped away in fine, longitudinal stripes. Tiny missiles of great hardness and incredible velocity had scored the armor from end to end. In seventeen places they had pierced it like needles going through the rind of a cheese. Seventeen tiny air-leaks had been plugged with a special gun firing bullets of near-molten lead.

The ship had the pitiful air of something whacked almost to death, like a maltreated horse. It lay exhausted on the desert sand, its tubes cooling for the last time, its casing showing a few dim hairlines of gold-like remnants of departed glory.

Vaguely discernible near the tail were coppery traces of the vessel's identification number: M.1. A number once to be conjured with. A number to fill the world's television screens and thrill the minds of millions. Newspapers still nursed typeset heads in four-inch letters featuring that identification.

M.1. COMES BACK.

They'd not had the opportunity to use it. M.1. was out of time and place. The proper time lay many

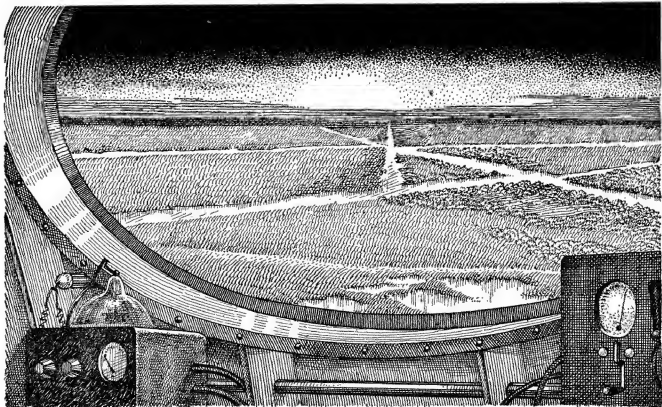
months back. The proper place was Luna City spaceport whence it had departed. Not here, lying in the desert like a corpse escaped from its grave. Not here with none to witness save the lizards and Gila monsters, the scrubwood, cacti, and tortured Joshua trees.

The man who came out the airlock was not better preserved than his ship. Gaunt, with hollow cheeks and protruding cheekbones, skinny arms and legs. His eyes had the luminous shine of the feverish. Yet he was active enough. He could get around fine provided it was at his own pace. That pace had three speeds: leisurely, slow, and dead-slow.

James Vail, thirty-three, test pilot first-class. Thirty-three? He brushed thin fingers through long, tangled hair, knew that he felt like sixty and probably looked it. So much the better. The sharp-eyed and inquisitive would pass him by, fooled by his appearance of agedness. With all their resources the powers-that-be would find it hard to trace a man who had aged enough to be his own father.

He left the ship without a qualm or so much as a backward glance. With respect to the vessel and its contents, his conscience was clear. World scientists would find precisely what they wanted within that exhausted cylinder. All was arranged in readiness for them: The samples, records, photographs, meterings, the cogent data. He had been meticulous about that. He had followed the line of duty to the last, the very last. There was nothing missing—save the crew.

A road ran seven miles to the north. He had landed the ship strategically, as near as he dared but safely concealed behind a long ridge. Now he set forth to reach the road, scuffling the sand like a stumblebum,



Most great men understand that they must pay a price for success; and the plaudits of masses, if attained, generally helps to overcome any bitterness cultivated by past suffering. But sometimes success is obtained at so great a cost that a man may desire nothing more than to lose himself in the anonymity of the masses. Eric Frank Russell tells of one successful man who felt that way. The survivor of the first round-trip to Mars, and his reasons for self-effacement, provide the basis of a story that is a tense suspenseful shocker.

(Illustrated by Lawrence)

resting many times on the way, sweating profusely.

Traffic was sparse and the wait for a hitch likely would be prolonged. That, too, could be regarded as advantageous in that it reduced the chance of some passer-by having seen the ship swooping in the distance.

In due time a big green sedan showed up, ignored his thumb, and roared past with a rush of wind and a scatter of hot grit. Without resentment he resumed his seat on the boulder. In the next couple of hours eight cars and a creaking feed-wagon pretended that he was not there. Eventually a huge red truck stopped and picked him up.

"Where ya for?" asked the driver, putting the truck in gear and letting it lumber forward.

James Vail settled himself comfortably in the cab, said, "Doesn't matter much. Any place where I can get a train."

The driver glanced at his passenger's hands, noted blue veins and swollen knuckles.

"Down on your luck, chum?"

"Not really. I've been sick."

"You look it."

Vail smiled wryly. "Some folks look worse than they are."

"How come you got stranded out here in the wilds?"

That was an awkward one. He thought it over, knowing that his mind was working with unaccustomed slowness.

"I was dumped six or seven miles back. I've been walking quite a piece. Nobody would give me a lift. Probably thought I'd try to stick them up."

"That happens," agreed the driver. "I've got a

"Not one of the fungi or lichens were edible."

sweet way of messing up such tricks, don't you worry."

He didn't offer details of his special technique . . . evidently it was intended only as a warning. He was a big man, red-faced and tough, but amiable. The type who could strangle in defense—or give his own dinner to a hungry dog.

"A trucker can pick up trouble any time the day or night," the driver confided. "A hundred miles back there was a flashy dame on the curb waving like crazy. Oh-o, I says, and beats it straight past. I been on this route before, see, and—"

He continued his reminiscences for an hour while Vail lolled by his side and filled occasional pauses with monosyllabic assurances that he was listening. The truck trundled into a small town. Vail sat erect, studying its shops. His tongue licked across thin, pale lips.

"Reckon this place will do me."

"You're forty miles from the railhead yet," the driver pointed out.

"Near enough. I'll make it later."

The truck stopped. Vail got down, moving stiffly.

"Thanks, brother. I appreciate the favor."

"Think nothing of it." The other waved a friendly hand and tooled his load away.





Eric Frank Russell, despite the grimness of this present story, is personally notable for his wit and outstanding sense of humor. Though science-fiction writing has never been more than an avocation to him, this Britisher is generally rated as being close to the top writers in the field. A volume of his more outstanding short stories is scheduled to appear shortly from Fantasy Press.

Vail stood on the sidewalk and watched the crimson bulk roll from sight. Just as well not to stay with that too long, he thought. A trail is harder to follow when breaks are frequent and erratic. In due time his would be picked up and every effort would be made to trace it through. Nothing was surer than that.

They would find the ship later today or perhaps tomorrow or even the day after. In these modern times air-traffic was heavy enough to ensure that some observant pilot would notice the grounded rocket and report it. State police would go and take a look at it, recognize it, call in the scientists.

From that moment the hunt would be on. Police spotter-planes scouring the desert. Police cars tearing along the roads. Vehicles halted over a wide area and drivers questioned.

"Did you go past that point? At what time? Did you see anything extraordinary? Did you notice a couple of fellows hanging around?"

Sooner or later a car or motorcycle would stop a big red truck.

"You did, eh? About ten-thirty? What was he like? Where did he say he was going? Where did you drop him?"

A phone-call back to this town and the local law would be out in force trying to pick up the new lead.

Yes, they'd be looking for him all right. Puzzled over his importance since there would be no criminal charge entered against him. But they'd obey orders and look, wanting him badly, moving fast and far.

Well, they weren't going to find him.

HE ENTERED a cheap restaurant down a side-street. In here, of all places, he must control himself, behaving casually enough to draw no undue attention. Finding a vacant table, he sat at it, consulted the menu with artificial boredom. It was a hell of an effort.

A blond and blowsy waitress came, flicked invisible crumbs from the table, awaited his order. Her eyes softened as she studied him, finding him a distinct change from the daily horde of guzzlers. He seemed to appeal to her suppressed maternal instincts.

"Ham and eggs," he said.

She weighed him up again. She asked, "Double?"

Biting back the response he wanted to make, he forced himself to say, "No—I'll have pie to follow."

It took a few minutes. He waited in patience, closing his eyes from time to time, compelling his mind to disregard sizzling sounds and appetizing odors issuing from the kitchen.

The load she brought made him suspect that she had taken matters into her own hands. If this were an ordinary serving, what was a double helping like? It alarmed him a little. It meant, perhaps, that she had got the measure of him and therefore would remember him.

Trackers follow the trail with the aid of people who find cause to remember the seemingly ordinary.

He must eat and get out of here with the minimum of delay. Yet he could not show indecent haste. So he picked up his knife and fork, shuddered slightly as

he felt them in his fingers. Then slowly he got through the plateful, savoring every morsel and pretending not to notice the waitress watching him from the far end.

The moment he had finished she was back at the table, removing the plate and eyeing him inquiringly.

"No pie," he said. "You gave me too much. Just coffee."

Momentary puzzlement showed in her features. Somewhere her calculations had gone wrong. Shows you can't judge folks by appearances, she decided. The longer one lives the more one learns.

Vail drank his coffee in easy sips, paid, and went out. He did not turn to see whether her gaze was upon him as he departed. Behave normally at all times, insisted his mind. Behave normally.

With the same unhurried air he strolled along the street, crossed a main artery, found another modest eating place. He went inside, had two large servings of pie and another coffee.

A-a-ah! that was better. Next call gained him a pack of cigarettes. He lit up and inhaled in the manner of one tasting the joys of paradise. Near the shop a long-distance bus pulled into a stop and an old lady with luggage struggled aboard. Vail managed a sudden sprint that would have been beyond him a short while ago. Clambering in, he found a seat near the front.

Trail-break number two.

AT THE END of three weeks he had settled himself seventeen hundred miles from M.I. Sheer distance provided a margin of safety no matter how temporary. He had a room in a dilapidated but adequate boarding-house, a job in a factory. Trainee welder, they called him. From a test pilot to trainee welder. He'd come down like a rocket.

Doubtless he could find employment better than that, something more suited to his capabilities, if he looked around long enough. But the two hundred dollars with which he had landed had slowly and surely dribbled away. Anything would do to keep him going pending appearance of other and better opportunities.

His looks had changed over these three weeks and he now bore reasonably close resemblance to the picture on his pilot license. Cheeks had filled out, arms and legs had thickened, hair had grown thicker and darker. His name also had changed. The factory filing system had him indexed as Harry Reber, forty-two, single and unattached.

Security of a job did not provide mental ease. He could not escape consciousness of the falsity of his position. Fellow-workers emphasized it almost every hour of every day. They would bawl, "Harry!" and frequently he would fail to respond and they would notice the failure. With the swift appreciation of men who toil they recognized him as one several cuts above his present station. They made mental note of the fact that none of his conversation revealed any significant thing about himself. There was a mystery about him sometimes discussed in desultory manner when he wasn't around. Left-wingers theorized that he was a stool-pigeon for the bosses. Others suspected a prison record.

All this could have been avoided and the square peg neatly fitted into a square hole by seeking a post with the moonboats. Pilots were always wanted there, especially top-grads. But the hunters knew that too. They'd be waiting for just such a move and ready with a countermove of their own.

"James Vail? I am a Federal officer. It is my duty to—"

Hah! He would not give them the chance. Duty

they'd call it to drag him where he did not want to go. What did they really know of duty? He had done his own duty according to his lights as best he could in terrible circumstances. Let that be enough and more than enough. Let him live in peace and obscurity without being crucified for the sake of other, lesser duties.

Every morning and evening when going to or from work he bought the latest paper, scanned the headlines. Then at the first opportunity he'd go right through it page by page, column by column. He grabbed one this evening, took it to his room, studied it from front to back.

Nothing about M.1. Not a solitary word. Yet they must have found it by now. They must want the crew. Nevertheless nothing had been issued to the press.

Why this secrecy?

It occurred to him as a somewhat remote and rather ridiculous possibility that those equipped to deal with the data on the ship might question its authenticity, might be unable to define it as true or false. Somebody with a strong imagination might have ventured the notion that it was all an elaborate hoax.

Though far-fetched, such a theory would explain the missing crew. They hadn't landed. They had never arrived. They had suffered some indescribable fate and something else had brought the ship home, something nonhuman and now running loose, God knows where. Or, alternatively, the crew had brought back the ship while possessed by parasitic masters now roaming the Earth with their human hosts.

Fantastic and not a little stupid—but if journalists managed to brew up such ideas for the sake of sensationalism they would scare the living daylights out of the public. Silence alone could prevent a wholesale stampede.

He shrugged fatalistically, fished out of his case a tattered newspaper rescued from a junkshop several days ago. Laying on his bed he opened it for the umpteenth time, absorbed the front page. Every time he did this he marveled at how quickly bygone events fade from public memory. Today the main subject of interest was the final stage of the Scarpilo murder trial. Probably not one person in court could recall the names of those who had made the headlines in this sheet dated almost two years back.

M.1. TAKES OFF.

Luna City, 9.0. GMT. The first ship to Mars roared into an airless sky and vanished precisely at deadline this morning. Pilot James Vail and Copilot Richard Kingston are on their way. By the time this report reaches the streets the long arm of Mankind will be extended many thousands of miles into the cosmos.

And so it went on and on and on. Pages full of it. Pictures of Vail, dark-haired and solemn. Pictures of Kingston, fair, curly, and grinning like a cat that has swiped the cream. Pictures of the President pressing the button that banged-off the boat by remote control. Articles by scientists about the men, the ship, and the equipment. Essays on how they'd cope with Martian conditions, what they hoped to discover.

A nine-day wonder. It had remained no more than that until the ship was due back. Then the papers and public interest had perked up again.

M.1. EXPECTED SOON.

More pictures, more articles, more anticipatory huzzahs. A coming thunderclap in human history. Nothing happened. The ominous note sounded two or three weeks later with the vessel that much overdue. It built up over the next month. It ended with grim acceptance of disaster. M.1. was no more. Vail and Kingston had paid for Mars just as twenty had

paid with their lives for the moon. *Requiescat in pace.*

And better luck next time.

He wondered whether the tardy return of M.1. had delayed or accelerated that same next time. Nothing he had read so far had made mention of any M. 2. The authorities had a habit of keeping such things quiet until the last moment. However, it was most probable that up there high in the sky on Luna another ship was taking shape and two or possibly three men were preparing for a second assault on the Red Planet.

There lay a major reason for pursuit of himself. They wanted the story from his own lips. They would never be satisfied with what he had left them.

What had he left them? One, there was a complete record of the ship's flight performance outward and inward. Two, the story of the main driver tube's crack-up: how they'd repaired it and how long it had taken. Three, full details of equipment faults or inadequacies of which there had proved to be many.

Samples of Martian sand and bedrock, spa and quartz, plus flakes of lignite-like substance that were anisotropic and therefore of possible use to radar. Several 14-foot-long string-thin groundworms coiled into pickle-jars. Also suspended in formalin were a few of those harmless wrigglers that might be either true snakes or legless lizards. Eight species of bugs. Twenty-seven varieties of lichens. Thirty of tiny fungi. Nothing big, because Mars had no life-forms of any size. Possibly microscopes would turn up something.

And he'd left them general data in great quantity. Water-dispersion maps showing supplies sparse except within 200 miles of polar-cap rims. Gravitic, magnetic field, photon intensity, and numerous other measurements. Temperature records running between 30°C and minus 80°C. Atmosphere pressure meterings from .5 to .9 mm. Hg. Notes by the bookful and graphs by the yard. It had been done as thoroughly as mortal men could do it.

But it wasn't enough.

A small part of the tale had been left out and they'd want that too—in his own words.

To hell with them!

IN THE mid-morning ten days later the shop foreman yelled, "Harry!"

It went in one ear and out the other.

The foreman crossed the floor, nudged him. "You deaf or something? I just called you. You're wanted at the front office."

Vail cut off his flame with a faint pop, closed valves on gas cylinders, removed his helmet and dark glasses. He tramped along a checkerplate catwalk, down steel stairs to outside. Moving him to another part of the plant, he hazarded, or perhaps about to fire him. Reaching the corner, he turned toward the office which was constructed in the style of a glass house.

That was the hunters' first mistake: waiting in plain view. Their second was in choosing a uniformed cop to drop the heavy hand. Vail saw who was there before he could be seen. He turned again, moved swiftly into the alley alongside the girder shop, got to the farther end, made his way to the time office.

There he found his time card and punched out. The watchman on duty ostentatiously consulted the time and looked him over.

"Heck's up with you?"

"Going home."

"Who said you could?"

"If you don't like it go complain to the chief," Vail suggested.

He walked out, leaving the other disgruntled but

not inclined to take action. Going straight to his room, he packed, paid his bill, called a taxi. Although he did not know it, he escaped by little more than a minute. The taxi was hardly out of sight when two men arrived, checked the address, strolled in, and came out running. They snooped around the station half an hour after his train pulled out.

Wires hummed alongside four routes taken by locomotives during those thirty minutes. Distant bus stations were staked. Police cars and motorcycles prowled exit roads. Switchmen and brakemen searched assembled freight trains and marshaling-yards for roof-bedders and rod-riders. Life became a misery for a few toughs, tramps, and parolees.

They did not get Vail. His wits had perked up along with his body. He had a mind designed for split-second decisions and equally quick translation into action . . . a test pilot's mind accustomed to facing sudden and grave problems and snatching the surest way out.

Weeks ago, long weary weeks ago, he had weighed up a major crisis, dealt with it and thereby created his present fix, there being no alternative in sight. Now he was dealing with the result in the only possible way: by keeping on the run until he was forgotten . . . or caught. If they caught him he would surrender all they wanted. But they must catch him first. On the other hand, if he could avoid capture for long enough they might forget him or dismiss him as of no consequence. That could happen in time. His importance would shrink to well-nigh nothing if M.2. landed on Mars.

Eighty-five miles out, the train slowed at a crossing. A traveling circus was the cause of the delay. It had halted in a colorful, mile-long procession waiting for the train to pass. The engineer reduced speed to a crawl for the sake of a line of fidgety elephants at the head.

Everyone gaped through windows at the circus. By the time they looked back Vail was out the opposite side, case in hand. He got a lift on the tailboard of a lion cage, sharing it with an unshaven character who could take out his teeth and force his bottom lip right up over his nose.

Forty miles farther on he had a job. The carnival hit its pitch and he was hired as a stake-driver, rope-puller, and general factotum. He dragged heavy canvas until his finger-tips were raw, watched the Big Top rise, billowing and huge. He helped set up the ropes, ladders, and trapezes for the Flying Artellos; he addressed the Fat Lady as Daisy and the India Rubber Man as Herman. He learned to refer to lions as "cats" and elephants as "bulls."

Somehow or other he'd been traced to that factory—how, he did not know. Possibly by sheer persistent legwork on the part of many. That meant they were definitely after him; the chase was more than a mere expectation of his own. And that in turn meant that despite continued silence M.1. had been found.

Therefore he would have to keep breaking the trail, no matter how smooth and enticing any section of it might be. He must not succumb to the temptation to stay with the circus too long. Neither must he hang around in the next place or the next. "No rest for the wicked" was a truism being sweetly illustrated.

When the hunt keeps on the move, the fox can't sit forever in the covert.

HE FOUND work again a thousand miles eastward. He had crossed the continent. But he could not go further short of taking to the seas. That was an idea not to be discarded. Sailors pass out of reach

for long periods and can be most difficult to trace, particularly if they jump ships in foreign ports.

For the time being he was satisfied with a checker's post on the loading-bay of a plant making cardboard containers. It paid modestly, enabled him to have a cheap apartment in a brownstone a mile away, and, above all, kept him concealed among the laboring hordes.

Eleven weeks had gone by since he'd thumbed that red truck, and still the television and the newspapers let out not a squawk. What discussions and arguments had taken place in official and scientific circles could be left to the imagination. The missing part of the story would have saved them a lot of breath, enabled them to see his problem and its sole solution. But those details were denied, leaving them with nothing but mystery.

Oh, the quandary he and Kingston had been compelled to contemplate. That busted driver and the weeks it consumed in putting right. The inevitability of planetary motions that can be slowed or halted for no man. The time that must be spent awaiting the next moment of vantage.

They'd filled a deal of that time making further and futile tests, raking Mars for what it had to offer and finding the cupboard appallingly bare. In his mind's eye he could see Kingston now, retching violently beside an overturned cooker. Not one of the thirteen fungi or twenty-seven lichens were edible. They could be swallowed fresh, boiled, baked, or fried and they went straight down and came straight up, leaving a man feeling ten times worse than before.

The question they'd had to answer was a very simple one, namely, whether to get the boat back at any cost or let it rot in the pink sands forever. Both knew there was only one response: M.1. must return. It could be done and they knew how it could be done . . . but never on this side of heaven could they agree about how to apply the method. The solution was not one for calm, reasoned discussion; it was for prompt settlement in one way only.

Brooding over these past things as he sat on the edge of his bed, he heard a knock, answered it without apprehension. Two men in plain clothes muscled through the open door.

The newcomers stood side by side, estimating him with hard, shrewd eyes. Yet a mite of uncertainty lay below their normal assurance. This was the first time in their experience that they'd been ordered to bring in a man without knowing the reason and without legal justification for arrest. Presumably he should be requested to come along as a special favor—and be carried out bodily if he refused. Anyway, this was one of the wanted pair. The other might not be far away.

"You're James Vail," said the older of the two. It was a statement, not a question.

"Yes."

No use denying it. The hunt had ended all too soon. The law's nation-wide net was more efficient and harder to evade than he'd ever believed.

Well, they'd got him. Lies might serve to delay the issue but never to avert it. Truth must out sooner or later. Get it over and done with. Get it off his mind. Strangely enough, he thought of that with a sense of vast relief.

"Where is Kingston?" demanded the other, hopefully.

James Vail stood up, hands dangling. He felt as if his belly was sticking out a mile with the whole world staring at it. The answer came in a voice scarcely recognizable as his own.

"I ate him."

+

RONALD REALLY wasn't a very good robot any more. His whole body was irreparably dented and scratched, and his chrome trim hung in rusty tatters—or what passed for tatters in the robot world. Still, Ronald waved his mecha-tentacles haughtily at the world at large; for above all Ronald was a snob.

One couldn't really say that this snobbery was wholly Ronald's fault. He was manufactured during the great Interplanetary Ores Boom. Built of light metals and unfit for any heavy work, he was every inch a rich man's toy.

While other robots were buried to their tread-tops in a stinking Venusian bog, or straining great gouts of Martian soil through their claws, our boy Ronald gambled over the world's golf greens, supplying vicarious pleasure to millionaires, earls, and other impedimenta of human civilization.

When the first all-robot expedition to Mercury returned to Earth, battered and meteor scarred, dear Ronald was rolling along a Long Island Polo Field, a mallet in each of his six mecha-tentacles, doing his best not to defeat the Prince of Wales' championship team too badly. In short, throughout his life, sports-model robot X5882 was a playboy, traitor to his own hard-working kind.

Thus it was no surprise to his less fortunate brothers when during the extremely successful Robot Rebellion of 2085 Ronald was dragged from the villa on the Mediterranean where he had been abandoned.

Towed through the rubble-strewn streets by two especially built mechanical shock troopers, he was hauled to Robot Square, headquarters of the district leader.

The commander, an extremely dented street-cleaning machine, focused his photocells on the small figure before him. His newly installed voice circuits arced a bit, and then boomed. "Robot X5882, you are guilty of high treason! You have been judged and found guilty of conspiring with the enemy, your former owners and employers, against your own kind. However, in view of the fact," he harrumphed, "that we have utterly destroyed their cities and driven these gibbering apes back into the dens where they belong..."

It had never been necessary for a robot to fall asleep. Faced, however, by this elevated garbage can's barrage of words, Ronald shut off his sensory circuits and drifted off into a limbo all his own.

He was rudely jounced back to consciousness by a sharp electric probe applied to his battery pack.

"Listen, squirt," the chief rattled, "Either you get

MISFIT

COVER STORY

by MICHAEL FISCHER



"Shadows of man and robot mingled."

A Short-Short +

his own clattering entrance, smaller, fainter scramblings. And then rounding a turn he saw them, huddled in the corner of what had once been an ancient storage room—humans!

They crouched in the light of a guttering torch, men in front ready to sell their lives dearly to protect their families. Ronald's single Cyclopean eye glowed redly. Parts revolved blurringly as the strangely rejuvenated robot clanked forward. A woman's scream mingled its echoes with those of Ronald's advance. The crash and clank of changing gears reverberated throughout the vault as the battered automaton rumbled onward, mecha-tentacles waving feebly.

In the mathematical center of the small room Ronald halted... The gaunt, unshaven travesties of humanity shifted grips on their clubs uneasily. Shadows of man and robot mingled and danced ghoulishly on the cracked granite walls.

Then as the huge photocell eye swept the room, long-dead speech rays stirred into life. Memories of green fields and well-kept lawns seemed to drift hauntingly up from the dusty floor.

The robot creaked slowly back on its springs, smiling inwardly as only a robot can smile. The low, well-modulated voice scarcely echoed in the vault. "Any-one for tennis?" said Ronald.

(Illustration by Peter Poulton)

Occasionally, hard-headed science is embarrassed to find that there is basic truth in what it believed for years to be but wild superstition. A spectacular case in point was the use of quinine bark by the natives of South America to aid in the prevention and control of malaria. For decades the white man suffered from the disease and refused to admit the medicinal value of quinine. Many legends, many superstitions, such as vampires, have been investigated at great length by scholars like Montague Summers, but believed by few. The future exploration of the planets is certain to uncover evidence, scientifically verifiable, of the existence of alien races, with—to us—shocking and horrifying, nightmarish physical natures.

IT WAS AN added bitterness to Lane Rawlings to discover that in the face of sudden disaster the Nachief of Frome could react with the same unshakable, almost contemptuous, self-confidence which he showed toward her and his other human slaves. That the lonely station of the Terrestrial Bureau of Agriculture and the nameless world far below them was both alert and heavily armed enough to ward off the attack of a spaceship should have come as a stunning surprise to him—and Lane would have exchanged her own very slim chances of survival at that point for the satisfaction of seeing the Nachief show fear.

Instead, he did instantly what had to be done to avoid the immediacy of complete defeat.

Lane's mind did not attempt to keep up with Nachief's actions. The ship was still rocking from the first blow of the unseen guns beneath, when she, Grant, and Sean were being flung into the central escape bubble. When a lock snapped shut behind them and the bubble lit up inside, she saw that the Nachief had followed them in and was crouched over the controls. Tenth of a second later came another explosion, triggered by the Nachief himself—an explosion that simultaneously ripped out the side of the ship and flung the bubble free . . .

LANE FOUND herself staring out of the bubble's telescopic ports at the sunlit, green and brown strip of land toward which they were falling. It was framed on two sides by a great blue sweep of sea. Behind them, to the left, was the glassy dome of the station, twin trails of white smoke marking the mile-long parallel scars the ship's guns had cut into the soil in the instant of the Nachief's savage, wanton attack. The trails stopped just short of the dome. Whoever was down there also had reacted in the nick of time!

The scene tilted violently outside, and Lane went

Illustrated by Charles Hornstein



"... he moved quietly back to Sally, gun ready . . ."

the vampire

by JAMES H. SCHMITZ





James H. Schmitz was born in Hamburg, Germany, 1911, of American parents. Flew with the army air corps in the South Pacific in World War II. Lost a small fortune manufacturing automobile trailers. The author at present is writing for a living and taking strong interests in various forms of psychology. He has been noted for westerns.

sprawling back on the forms of Sean and Grant. The two colonists gave no indication even of being conscious; they had sat about like terrorized children for the past several days; they lay there now like stunned animals. Regaining her balance, Lane realized the bubble was falling much too fast, and for an instant she had the fierce hope that it was out of control.

Then she understood: he wants to get us down near that station—near a food supply! A wave of sick, helpless fury washed over her.

The Nachief looked around, grinning briefly, almost as if he had caught the thought.

"Pot-shooting at us, Lane! Don't worry—we'll make it!"

The deep voice; the friendly, authoritative, easily amused voice she'd been in love with for over a year! The voice that had told her, quite casually, less than thirty-six hours ago, that she and Sean and Grant would have to die, because she had found out something she wasn't supposed to know—and because she had made the additional mistake of telling the other two! The voice had gone on as casually to describe the grotesque indecency of the kind of death the Nachief was planning for them—

She stared at the back of his massive blond head, weak with her terror and hatred, until the bubble lurched violently again, flinging her back. This time, when she scrambled up on hands and knees, they were dropping with a headlong, rushing finality that told her the bubble had been hit and was going to crash. But they were still a mile above ground.

She offered no resistance when the Nachief picked her up and hauled her out of the lock with him.

RIBBON-CHUTES were unfolding in a coordinated pattern of minor jolts above them. Though it was only the Nachief's arm that held her clamped hard against his side, Lane felt quite insanely calm! They had dropped below the point where the station's gunners could target on them; he was going to get her down alive; he had no intention of giving up his prey merely because his own life was in danger! Something struck against her legs—the barrel of the big hunting gun he held in his other hand. A sudden cunning thought came to her, and she went completely limp, waiting.

The ground was less than a hundred feet below, turning, tilting, expanding and rushing up at them, before she flung herself into a spasm of furious activity. She heard the Nachief's angry shout, felt them sway and jerk as his arm tightened with punishing, rib-cracking intensity about her. Then they struck.

Lane stood up presently, looked about dazedly and went limping over to the Nachief. He lay face down two hundred feet away. The chutes were entangled in a cluster of stubby trees, but they had dragged him that far first. He was breathing. He wasn't dead; but he was unconscious! She stared down at him incredulously, briefly close to hysterical laughter. She couldn't have done it intentionally; the Nachief kept his slaves under a repression to attempt no physical

harm against him. She was free, for the moment anyway, only because she had tried to kill herself! Her glance went to a rock near his head, but a sense of weakness, a heavy dread, swept through her instantly.

The thing to do was to get out of the vicinity immediately! If she could reach the station before he did, she might warn its occupants what they were up against—provided they didn't kill her first. The Nachief's hunting gun lay almost at the point where she had fallen. It was too heavy for her use; but she paused long enough to thrust it hurriedly into a tangle of dry brush which should hide it from him for a while. Then she set off in the general direction of the station.

Only five hundred yards away, she had an unexpected glimpse of the crashed bubble in open ground far below her and stopped to stare at it with a sensation of horrified remorse. Grant and Sean hadn't had a chance after she had told them what she knew about the Nachief; in a way, she was responsible for their deaths. Hurrying on, she dismissed the thought with an effort, because it was more important just now that somebody might be coming out from the station to investigate the crash. But she couldn't risk waiting here; the station must be more than three miles away; and her fear of the Nachief actually still seemed to be growing! Out of sight and sound, the illusion of humanity he presented was dropping away. What remained was an almost featureless awareness of a creature as coldly and savagely alien as a monstrous spider—

Suddenly breathless and shaking, Lane stopped long enough to fight down that feeling. When she set off again, it was at a pace designed to carry her all the way to the station, if nobody came to meet her.

Ten minutes later, she heard the sharp crack of a missile-gun and a whistling overhead, followed by a distant shout. It wasn't the Nachief's gun; and she turned to look for her challenger, a vast relief flooding through her.

THE TALL, brown-skinned man who stepped out of a little gravity-rider a few dozen feet away held a gun in his hands, but looked at Lane with no particular indication of anything but self-confident wariness and some curiosity. A sharp-snouted, sinuous, streamlined animal, something like a heavy, short-legged dog, flowed out of the rider's door behind him, sat up on muscular haunches and regarded Lane with gleaming black eyes. The man said, "Unh-uh, Sally!" warningly.

"Any other survivors?" His voice was not loud but carried the same self-assurance as his attitude.

"Only one!" Lane hadn't missed the by-play. That animal, whatever it was, needed only a gesture to launch itself at her throat; its lean brown form was that of a natural killer, and the command could easily be given! "Look," she hurried on, "will you just listen to me for thirty seconds, without interrupting—without any questions?"

"Thirty seconds?" He almost smiled. "Why not?" "This other survivor—he's armed and dangerous! He's the one who tried to destroy your station—"

She hesitated and swallowed, realizing for the first time how preposterous her story would sound. "He's not a human being!" she said flatly, almost sullenly.

The man's eyes might have become a trifle more wary, but he only nodded. And suddenly something seemed to break in Lane. She heard herself babbling it out—how Frome was a small human colony on a franchised world; how they had gone out there in a group from the Hub Systems a year before. That the

Nachief, Bruce Sinclair Frome, had organized the emigration, the trip, everything. She'd been his secretary—

The station man kept on nodding and listening, noncommittally.

"I found out a few days ago that he's a man-eater! A blood-drinker—like a vampire— That was why he had set up the colony of Frome. He had eight hundred people under hypnotic control, and he was using ultrasonic signals to keep the controls in force. He's got instruments for that!" Lane said, her voice going shrill suddenly. "And he's been living on our blood all along, and nobody knew, and—"

"Take it easy!" It was a crisp though level-toned interruption, and it checked her effectively. She was sweating and shivering.

"You don't believe me, of course! He'll—"

"I might believe you!" the man said amazingly.

"You think he's after you now?"

"Of course, he's after me! He'll want to keep me from telling anyone! He brought us out here to kill us, the three who knew. The other two crashed in the bubble . . ."

He studied her another moment and motioned toward the gravity rider. "Better get in there!"

The brown animal he'd called Sally slipped into the back of the rider ahead of Lane. It had a pungent, catty odor—the smell of a wild thing. The man came in last, and the rider rose from the ground. Seconds later, it was tracing a swift, erratic course at a twenty-foot height among the trees, soundless as a shadow.

"We're retreating a bit until we get this straightened out," the station man explained. "My name's Frazer. Yours?"

"Lane. Lane Rawlings."

"Well, Lane, we've a problem here! You see, I'm manning the station alone at present—unless you count Sally! There's a mining outfit five space-days away; they're the closest I know of. But they're not too cooperative! They might send an armed party over if I gave them an urgent enough call; and they might not. Five days is too long to wait anyway. We'll have to handle this ourselves!"

"Oh, no!" she cried, stunned. "He—you don't realize how dangerous he is!"

"There'll be less risk," Frazer continued bluntly, "in going after him now, before he gets his bearings, so to speak, than to wait till he comes after us! We're on an island here, and it's not even a very big island. If he's—well, a sort of ogre, as you describe him—he'll find precious little to live on! The Bureau cleaned the animal life off the island quite a while ago. We're using it as an experimental ranch."

"Why can't we lock ourselves up in the station?" Fear was pounding in her again, a quick, hot tide.

Frazer brought the rider around in a slowing turn, halting it in mid-air.

"There's some sixty years of experimental work involved!" he explained patiently. "And some of our cultures, some of the stuff we're growing here, becomes impossibly dangerous if it's not constantly controlled. The Bureau could get out a relief crew within two weeks, but we'd be obliged to raze the island from one end to the other by that time. That's getting rid of your Nachief of Frome the hard way!"

Lane realized in abrupt dismay that she wouldn't be able to shake this man's hard self-confidence. And recalling suddenly the speed and effectiveness with which he had countered the Nachief's space-attack, she admitted that he might have some justification for it.

"He's got a long-range hunting gun!" she warned



"Ribbon chutes were unfolded."

shakily. "I suppose you know what you're doing—"

"Sure I know!" Frazer smiled down at her. "Now, I'll drop you off at the station; and then Sally and I will go after your friend—"

"No!" she interrupted, terrified again at the prospect of being trapped alone on an island with the Nachief of Frome if Frazer failed. "I'll go with you! I can help."

Frazer seemed surprised but pleased. "You could be

a help at that!" he admitted. "Particularly since you know all his little ways! And we've got the rider—that should give us about the advantage we need . . ."

"WHAT MAKES you so sure," Lane inquired a while later, "that he'll come to the bubble? He may suspect it's being watched!"

They sat side by side hidden by shrubbery, a half mile from the wreck of the escape bubble, on somewhat higher ground. The gravity rider stood among bushes thirty feet behind them; and a few hundred yards behind that was a great, rugged cliff face, bare of vegetation, which curved away to their left until, in the hazy distance, it dipped toward the sea.

"I imagine he does suspect it," Frazer conceded. "If he's anywhere around, he may even have seen us touch ground here!" They had lifted high into the air to scan the area but had made sure of only one thing: that the Nachief of Frome was no longer where Lane had left him. On the other hand, there were a great many places where he could be by now. This part of the island was haphazardly forested; thickets of trees alternated with stretches of rocky soil which seemed to support only a straw-colored reed; and zigzagging dense lines of hedgelike growths, almost black, seemed to follow concealed water-courses. Except for the towering cliff front, it was a place without distinguishing features of any kind where one could get lost very easily. It also provided, Lane realized uncomfortably, an ideal sort of background for the deadly game of hide-and-seek in which she was involved.

"He hasn't much choice though!" Frazer was saying. "As I told you, the island's bare of all sizable animal life. He'll get hungry eventually."

Staring at the bubble, Lane felt herself whitening. Frazer went on, unaware of the effect he'd produced or unconcerned about it. "The other thing he might try is to get into the station, but his gun won't help him there. So he'll be back—" His eyes shifted past Lane to the wide spread of scrub growth beyond her. "Just Sally!" he said in a low voice, as if reassuring himself.

Sally came gliding into view a moment later, raised her head to gaze at them impersonally and vanished again with an undulating smoothness of motion that reminded Lane of a snake. It was as if the creature had slipped without a ripple into a gray-green sea.

"Trapped Sally on the mainland four years ago," Frazer remarked conversationally, still in low tones. "A seventy-pound killer and more brains than you'd believe! In bush like this, the average armed man wouldn't stand a chance against Sally. She knows pretty well what we're here for by now!"

Lane shivered. Something about the cool, unhurried manner of Frazer as he talked and acted gave her, for minutes at a time, a sense of security she knew was false and highly dangerous. He seemed actually incapable of understanding the uncanny deadliness of this situation! She felt almost sorry for Frazer.

"You're wondering why I'm so afraid of him, aren't you?" she said slowly.

Frazer didn't answer immediately. Gun across his knees, a small knapsack he'd taken out of the rider strapped to his hip, he was studying her, pleasantly enough, but not without an obvious appreciation of what he saw, even a touch of calculation. A tall, sun-darkened, competent man who felt capable of handling this or any other problem that might come his way to his complete satisfaction!

"Irrational fear of him could have been part of that hypnotic treatment he gave you!" he told her, almost absently.

Lane shrugged, aware of a wave of sharp irritation.

In the year since she'd known Bruce Sinclair Frome, she had almost forgotten the attraction the strong, clean lines of her body had for other men; she was being reminded of it now. And, perhaps because of that, she was realizing that part of her hatred for the Nachief was based in the complete shattering of her vanity in being discarded by him. She had a moment of unpleasant speculation as to what her reaction would have been if she had found out the truth about him—but had found out also that he still wanted her, nevertheless . . .

She drove the thought away. The Nachief would die, if she could abet it. But the chances were that he regarded her and this overgrown boy scout beside her as not much more of a menace than Sean and Grant had been! She sat silent, fingering the small Deen nerve-gun Frazer had given her to pocket—"just in case!" She'd warned him she probably wouldn't be able to force herself to use it—

"I just had the pleasant notion," Frazer remarked, "that your Nachief might ramble into one of our less hospitable cultures around here! That's what happened to the last two assistants they gave me, less than six months ago—and it would settle the problem, all right!" He paused, thinking. "But I suppose any reasonably alert outworlder would be able to spot most of those things."

"I'm afraid," Lane agreed coolly, "that he'll be quite alert!"

HE LOOKED at her again, digesting that in silence. "You really believe he isn't human, don't you?"

"I know he isn't human! He's different biologically. He actually needs blood to live on!"

"Frome was his farm, and you colonists were his livestock, eh?"

"Something like that," she said, displeased at a description that was accurate enough to jolt her.

"The three of you he brought out here—what was his purpose in that?"

"To turn us loose, hunt us down, and eat us!" Lane said, all in a breath. And there was a momentary, tremendous relief at having been able to put it into so many words, finally.

Frazer blinked at her in thoughtful silence. "That gives us a sort of special advantage!" he grinned then. "There's a group of primitive little humanoids along the mainland coast the Nachief could live on, if he got over there. But he doesn't know about them. So he'll be pretty careful not to blast us to pieces with that big gun you told me about."

Lane twisted her hands hard together. "He'd prefer that . . ." she agreed tonelessly.

"Now there's the gravity rider!" Frazer turned a glance in the direction of the half-hidden vehicle behind them. "It gives us the greater mobility. If I were the Nachief, I'd wreck the rider before I tried to close in!"

"And what do we do then?"

"Why, then we'll have a few tricks to play!" He gave her his quick grin. "The rider's our bait. Until the Nachief takes it—or shows himself at the bubble—we can't do much about him. But after he's taken it, he'll try to move in on us."

Lane shook her head resignedly. She didn't particularly like Frazer; but she had a feeling now that he wasn't bluffing. He was decidedly of a different and more dangerous breed than the colonists of Frome. "You're in charge!" she said.

"Still afraid of him?" he challenged.

"Plenty! But in a way this is better than I'd hoped

for. I thought if I told anyone here about the Nachief, they'd think I was crazy—until it was too late!"

Frazer scratched his chin, squinting at the distant bubble, as if studying some motion she couldn't see. "If he isn't human," he said, "what do you think he is?"

"I don't know!" she admitted, with the surge of superstitious terror that speculation always aroused in her.

"I might have thought you were crazy," Frazer went on, smiling at her, "except—it seems you've never heard of the Nalakians?"

She shook her head.

"It was a colony of Earth people. Not too far from the Hub System, but not much of a colony either—everybody seems to have forgotten about it for about eight generations after it was started. When it was rediscovered, the descendants of the original colonists had changed into something more or less like you describe your Nachief! There were internal physiological modifications—short intestines like a cat or weasel; I forget the details. Those new Nalakians showed a cannibalistic interest in other human beings, which may have been mainly psychological; and they're supposed to have been muscled like tigers, with a tiger's reactions. In short, a perfect human carnivore type!"

He had her interest now—because it fitted! She sat up excitedly. "What happened to them?"

Frazer grinned. "What a tiger can expect to happen when he draws too much attention to himself! They raided a colony in another system, got tracked back to their own planet, and were pretty thoroughly exterminated. All that was about eighty years ago. But there may have been survivors in space at the time, you see; and those survivors may have had descendants who were clever enough to camouflage themselves as ordinary human beings! I thought of that when you first told me about your Nachief."

It gave her a curious sense of relief. The Nachief of Frome had become somewhat less terrifying, seemed much more on a par with themselves. "It could be."

"It could very much be!" Frazer nodded. "Aside from wanting to play cat-and-mouse with you, he didn't tell you of any special motive for bringing you to this particular world, did he?"

"No," Lane said puzzled. "He was taking us away from Frome, so he could make it look like an accident. What other special motive should he have?"

"Probably not a very sane one," Frazer said, "but it checks, all right; I was born on this station, you see, and I know the area pretty well. This planet is Nalaka, and the original Nalakian colony was on the mainland, only eight hundred miles from here! They even used animals like Sally there in their hunting!"

They stared at each other in speculative silence; and Lane shivered.

"They're not here now!" Frazer said positively. "Not one of them—or I would have spotted their traces. But what was his purpose? A sort of blood-sacrifice to his lamented ancestors, or to planetary gods? I almost wish we could take him alive, to find out—"

He stopped suddenly. Lane stiffened, wondering what he'd seen or heard, and he made a tiny gesture with one hand, motioning her to silence. In the stillness, she became aware of something moving into her range of vision to the left and becoming quiet again; and she realized Sally had joined them.

Then there were long seconds filled with nothing but the wild beating of her heart.

The period ended in a brief, not-very-loud thudding sound behind them, which was nevertheless the complete and final shattering of the gravity rider!

The Nachief of Frome had grounded them.



"The Nachief of Frome had grounded them."

MORE THAN a mile off Frazer was flattened on the rocky ground beside her, pulling her backward. "He's got me outgunned, all right! Now, just keep crawling back till you reach the gully that's twenty feet behind us. When you get there, keep low and let yourself slide down into it."

Lane tried to answer and shook her head instead.

"Is he using one of those ultrasonic gadgets you were telling me about? Sally feels something she doesn't like!"

"I—I don't know! He never used one on me before!"

"Well, how do you feel?"

"It's crazy!" she bleated. "I want to run back there! I want to run back to him!" Her legs were beginning to jerk uncontrollably.

"Close your eyes a moment, Lane!"

She didn't question him . . . he was going to do something to help her. She closed her eyes.

VERY GRADUALLY, Lane Rawlings became aware of the fact that she and Frazer and Sally were in a different sort of place now. It began to shape itself in her consciousness as a deeply shaded place with tall trees all around. To the right, a wall of gray rock rose steeply to a point where it vanished above the tops of the trees. The nearby area was dotted with boulders and grown with straggling gray grass; it was enclosed by solid ranks of gray-green thickets which rose up to a height of twenty feet or more between the trees.

Lane had a vague feeling next that a considerable amount of time had passed. Only then did she realize that her eyes were open—and that she was suspended somehow in mid-air, her feet free of the ground. The next thing she noticed was that her hands were fastened together before her. Jolted fully awake by that, she discovered finally the harness of straps around her by which she swung from a thick tree-branch overhead.

Frazer was standing beside her. He looked both apologetic and grimly amused.

"Sorry I had to tie you up! You were being very active!" His voice was low and careful.

"What happened?" Becoming aware of assorted aches and discomforts in her body, she squirmed futilely. "Can't you let me down?"

"Not so loud!" He made a gesture of silence. "Afraid not! Your friend isn't so far off, though I don't think he's actually located us as yet."

She swallowed and was still.

"He keeps trying to get a reaction out of you," Frazer went on, in the same careful tone. "It's some kind of signal. Sally can sense it, and it makes her furious; though I don't feel anything myself. You must be conditioned to it—and the effect is to make you want to run toward the source of the vibrations!"

"I didn't know he'd brought any instruments with him," Lane said dully.

"He may not have intended to use them, unless the game took a turn he didn't like. Which I expect it has now! I gave you a hypo shot back at the gully that knocked you out, an hour ago," he added mildly. "The reason you're tied up is that, conscious or not, you keep trying to run back to the Nachief. It's rather fantastic to watch, but running in the air won't get you any closer to him..."

He turned suddenly. Sally, upright on her haunches twenty feet away, had made a soft, snarling sound. Her head was pointing at the thickets to their left, and the black eyes glittered with excitement.

"Better not talk any more!" Frazer cautioned. "He's fairly close, though he's taking his time. He's a good hunter!" he added with a curious air of approval. "Now I'm giving you another shot to keep you quiet while he closes in, or he might be able to force you to do something that would spoil the play." He was reaching for her arm as he spoke.

Lane started to protest but didn't quite make it. Something jolted through her body like an electric shock; her legs jerked violently—and Frazer's face, and the trees and rocks behind him, started vanishing in a swirling blackness. In the blackness, she felt herself running; and at its other end, the Nachief's smiling face looked at her, waiting. She thought she was screaming and became briefly aware of the hard, sweaty pads of Frazer's palm clasped about her mouth.

FRAZER stood beside Lane's slowly twisting and jerking body a few seconds longer, watching her, anxiously, because he couldn't very well load her down with any more drug than she was carrying right now! Satisfied then that she was incapable of making any disturbance for the time, he moved quietly back to Sally, gun ready in his hands.

"Getting close, eh?" he murmured. Sally twitched both ears impatiently and thereafter ignored him.

Frazer, almost immediately, became as oblivious of his companion. In a less clearly defined way, he was also quite conscious of the gradual approach of the Nachief of Frome, though the fierce little animal beside him was using more direct channels of awareness. He knew that the approach was following the winding path through the thickets he had taken thirty minutes earlier with Lane slung across his shoulder. And he didn't need the bristling of the hair at the back of his neck or the steady thumping of his heart to tell him that an entirely new sort of death was walking on his trail!

If the Nachief of Frome followed that path to the end, he told himself calculatingly, it was going to be a very close thing—probably not even the fifty-fifty chance he'd previously considered to be the worst he need expect! He had selected the spot where they and their guns would settle it, if it came to that; but it would be the Nachief then who could select the exact instant in time for the meeting. And Frazer knew by now, with a sure, impersonal judgment of himself and of the creature gliding up the path, that he was outmatched. The Nachief simply had turned out to be a little more than he'd counted on!

For a long minute or two, it seemed the stalker had stopped and was waiting. Lane hung quietly in her harness; so Frazer decided the Nachief had given up trying to prod her into action. So he knew, too, now that it was between himself and the Nachief! Frazer grinned whitely in the shadows.

But what happened next took him completely by surprise. A sense of something almost tangible but in-

visible, a shadow that wasn't a shadow, coming toward him! Sally, Frazer realized, wasn't aware of it; and he reassured himself by thinking that whatever Sally couldn't detect could not be very damaging, physically. Nevertheless, he discovered in himself, in the next few seconds, an unexpected capacity for horror! The mind of the Nachief of Frome was speaking to him, demanding, a momentary indecision overlying its dark, icy purpose of destruction. Frazer, refusing the answer, felt his own mind shudder away from that contact.

Almost immediately, the contact was broken; the shadow had vanished. He had no time to wonder about it; because now the final meeting, if it came, would be only seconds away...

Then, as if she had received a signal, Sally made a soft, breathing sound and settled slowly back to the ground on all fours, relaxing. She glanced up at Frazer for a moment, before shifting her gaze to a point in the bushes before her.

Frazer, a little less certain of his senses, did not relax just yet. But he, too, turned his eyes cautiously from the point where the path came into the glade to study the thickets ahead of them.

Those twenty-foot bushes were an unusual sort of growth. Not a native of Nalakia—but one of the Bureau of Agriculture's imported experiments that couldn't have been tolerated on any less isolated world. The tops of a group of the shrubs dead ahead, near one of the turns of the hidden path, were shivering slightly. The Nachief, having decided to make his final approach through the thickets, was a sufficiently expert stalker not to disturb the growth to that extent.

The growth was disturbing itself...

Aware of the warm-blooded life moving through below it, it was gently shaking out the fluffy pods at its tips to send near-microscopic enzyme crystals floating down on the intruding life-form. Coating it with a fine, dissolving dust—

Dissolving through the pores of the skin; entering more swiftly through breathing nostrils into the lungs! Seeping through mouth, and ears, and eyes—

A thrashing commotion began suddenly in the thickets. It shook a new cloud of dust out of the pods, which made a visible haze in the air, even from where Frazer stood. He watched it a trifle worriedly, though the crystals did not travel far, even on a good breeze. The growth preferred to contact and keep other life-forms where they would do it the most good, immediately above its roots.

The thrashing became frenzied. There was a sudden gurgling screech.

"That's fine!" Frazer said softly between his teeth. "A few good breaths of the stuff now! It'll be over quicker!"

More screeches, which merged within seconds into a wet, rapid yapping. The thrashing motions had weakened but they went on for another half minute or so, before they and the yapping stopped together, abruptly. The Nachief of Frome was giving up life very reluctantly; but he gave it up.

And now, gradually, Frazer relaxed. Oddly enough, watching the tops of the monstrous growth that had done his killing for him continue to quiver in a gentle, satisfied agitation, he was aware of a feeling of sharp physical letdown. Almost of disappointment—

But that, he realized, was scarcely a rational feeling! Frazer was, by and large, a very practical man.

SOME TIME later, he removed from his knapsack one of the tools an employee of the Bureau's lonely outworld stations was likely to require at any time. Carefully, without moving from his tracks,

he burned his vegetable ally out of existence. With another tool, he presently smothered the spreading flames again.

After a little rummaging, he discovered what must be the ultrasonic transmitter; a beautifully compact little gadget, which the fire had not damaged beyond the point of repair. Frazer cleaned it off carefully and pocketed it.

It was near nightfall when he put Lane Rawlings down on his bed in the station's living area. She had not regained consciousness on the long hike back to the station; and he was a little worried, since he had never been obliged to use that type of drug in so massive a dose on a human being before. However, he decided on investigation that Lane was sleeping naturally now—and that the sleep might be due as much to emotional exhaustion as to the effects of the drug. She should wake up presently, very hungry and with very sore muscles, but otherwise none the worse.

Strengthening up, he found Sally beside him with her forepaws on the bed, peering at the girl's face. Sally looked up at him briefly, with an obvious question. The same hungry question she had asked when they first met Lane.

He shook his head, a gesture Sally understood very well. "Unh-uh!" he said softly. "This one's our friend—if you can get that kind of idea into your ugly little head! Outside, Sally!"

He shut the door to the room behind him, because one couldn't be quite sure of Sally, though the chances were she would simply ignore the girl's existence from now on. A decision involving Lane Rawlings had been shaping itself in his mind throughout the day; but he had kept pushing it back out of sight. There was no point in getting excited about it before he found out whether or not it was practicable.

Sally padded silently after him as he made his customary nightfall round of the station's control areas. A little later, checking one of the Bureau's star-maps, he found the world of Frome indicated there; which was exceptionally good luck, since he wouldn't have to rely now on the spotty kind of information regarding its location he could expect to get from Lane. And, considering his plans, the location couldn't have been improved on—almost but not quite beyond the range of the little stellar flier waiting to serve in emergencies in its bombproof hangar beneath the station! He intended to leave the Bureau's investigators no reason to suspect anything but a destructive space-raid had occurred here; but even if he slipped up, they wouldn't think of looking for Frazer as far away as Frome!

What had been no more than a notion in his mind not many hours before suddenly looked not only practicable, but foolproof! Or very nearly—

Whistling gently, he settled down in the central room of his living area, to think out the details. Now he could afford to let the excitement grow up in him!

"Know what, Sally?" he addressed his silent companion genially. "That might, just possibly, have been my old man we bumped off today!"

It was a point Sally wasn't interested in. She had jumped up on a table and was thumping its surface gently with her tapered, muscular tail, watching him—waiting to be fed. Frazer brought a container that held a day's rations for Sally out of a wall cabinet, and emptied its liquid contents into a bowl for her. Sally began to lap. Frazer hesitated a moment, took out a second container and partly filled another bowl for himself. Looking from it to the animal with an expression of sardonic amusement, he raised the second bowl to his lips. Presently he set it down empty. Sally was still lapping.

IT WASN'T too likely, he knew, that the late Nachief of Frome actually had been his father. But it was far from being an impossibility! Frazer had known since he was twelve years old that he had been fathered by a Nakalian living in the Hub Systems. His mother had told him, when an incident involving one of the humanoids of the mainland had revealed Frazer's developing Nakalian inclinations. She had made a fumbling, hysterical attempt to kill him immediately afterward, but had died herself instead. Even at that age, Frazer had been very quick. It had taught him, however, that to be quick wasn't enough—even living on the fringes of the unaware herds of civilization as he usually was, there remained always for one of the Nakalian breed the disagreeable necessity of being very cautious!

Until today—

At this point in his existence, he could afford to drop caution. Pure, ruthless boldness should make him sole lord and owner of the colony and the world of Frome within a week; and Frazer was comfortably certain that he had enough and to spare of that quality to take over his heritage in style.

He studied the Nachief's ultrasonic transmitter a while.

"Have to learn how to use this gadget!" he informed Sally idly. "But it's not very complicated. And if he has a system already set up—"

Otherwise, he decided, he was quite capable now of setting one up himself! An attempt to assume hypnotic control of his two latest station assistants had turned out unsatisfactorily half a year before, so that he'd been obliged to dispose of them; but the possibility of reinforcing controls by mechanical means hadn't occurred to him at the time. His admiration for the Nachief of Frome's ingenuity was high. But it was mingled with a sort of impersonal contempt.

"Sally, if he hadn't overplayed it like a fool, he would have had all he could want for life! But a pure carnivore's bound to have a one-track mind, I suppose—"

He completed the thought to himself: That he had a very desirable advantage over the Nachief there! Biologically, he could get by comfortably on a humanly acceptable diet; and aside from the necessity of indoctrinating Lane Rawlings with a suitable set of memories, he might even decide to refrain from the use of hypnotics, until an emergency might call for them. His Nakalian qualities, sensibly restrained, would make him a natural leader in any frontier colony; and there was something intriguing now about the notion of giving up the lonely delights of the predator to assume that role on Frome! In another generation, the mutant biological pattern should be diluted beyond the danger point in his strain; and no one need ever know—

Frazer chuckled, somewhat surprised by the sudden emergence of the social-human side of him—and also aware of the fact that he probably wouldn't take the notion too seriously in the end! But that was something he could decide on later . . .

He sat there a while, thinking pleasantly of Lane's strong young body. To play the human role completely should have undeniable compensations! Finally he became aware of Sally again, watching him with quiet black eyes. She had finished her bowl.

"Have some more?" he invited good-humoredly. "It's a celebration!"

Sally licked her lips.

He poured the balance of his container into her bowl and stood beside her, scratching her gently back of the ears, while she lapped swiftly at the thick, red

liquid, shivering in the ecstasy of gorging. Frazer waited until she had finished the last drop before shooting her carefully through the back of the skull; and Sally sank forward without a quiver and lay still.

"Hated to do it, Sally!" he apologized gravely. "But I just couldn't take you along. We carnivores can't ever really be trusted!"

Which was, he decided somewhat wryly, the simple truth! He might accept the human role, at that; but, depending on the circumstances, never quite without qualification—

It was almost his last coherent thought. The very brief one that followed was a shocked realization that the sudden, terrible, thudding sensation in his spine and skull meant that a Deen gun was being used on him!

On that note of surprise, he blacked out.

LANE RAWLINGS remained motionless in the doorway behind Frazer, leaning against it as if for support, for a good three minutes after he had dropped to the floor and stopped kicking. It wasn't that she was afraid of fainting; she only wanted to make very sure, at this distance, that Frazer was going to stay dead. She agreed thoroughly with his last remark.

The thought passed through her mind in that time that she could be grateful to the Nachief of Frome for one thing, at any rate—it had amused him to train his secretary to be a very precise shot!

After a while, she triggered the Deen gun once more, experimentally. Frazer produced no reactions now; he was as dead as Sally. Lane gave both of them a brief inspection before she pocketed the little gun and turned her attention to the food containers in the wall cabinet. With some reluctance, she opened one and found exactly what she expected to find. Now, the mainland humanoids Frazer had talked about might have a less harried existence in the future!

She looked down at Frazer's long, muscular body once more, with almost clinical curiosity, and then left the room and locked it behind her. She had no intention of entering it again; but there was evidence here that would be of interest to others—provided she found herself capable of operating the type of communicators used by the station.

Thirty minutes later, with no particular difficulty,

INTELLIGENCE FACTOR

comparison had to be made—they had serious structural shortcomings. But necessity could devise compensations for physical handicaps—especially since their hosts received the virus without unfavorable reactions. The symbiotes luxuriated in their new-found cellular warmth and vitality, the while prudently considering their hosts' most urgent problem, lack of intergenus communication . . .

The monkeys looked at each other and knew that they were alone and utterly alone, because they were unique. The knowledge had been deduced and flashed between them in a wordless process that was in itself unique. For Jo-Jo and Jackie would never need words now, not with pure concepts originating from the virus phoenix-like in their minds, clear for each other to see and elaborate on.

But there was this constant, disturbing awareness of self, this loneliness and yearning for others of their kind! And wasn't there danger, too? They were confined here. The humans were larger than they and stronger . . . stronger?

Jackie flashed Jo-Jo an idea. Approvingly, he signaled her a somewhat modified picture, and after

she had contacted the area headquarters of the Bureau of Agriculture. She gave them her story coherently; and even if they didn't believe her, it was obvious they would waste no time in getting a relief crew to the station. Which was all Lane was interested in. After the Bureau concluded its investigations, somebody might do something about providing psychological treatment for the Frome colonists; but she wasn't concerned about that. She was returning to the Hub Systems.

She remained seated in the dim light of the communications cell for a time, watching her dark reflection in the polished surfaces of its walls and listening to the intermittent whirring of a ventilator in the next office, which was all that broke the silence of the station now. She wondered whether she would have become suspicious of Frazer soon enough to do her any good, if she hadn't known for the past few weeks that she was carrying a child of the Nachief of Frome. For the past three days, she had been wondering also whether saving her life, at least for a while, by informing the Nachief of the fact, would be worth while! It was easy to imagine what a child of his might grow up to be.

Unaware, detail by detail since their meeting, Frazer had filled out her mental picture of that. So she had known enough to survive the two feral creatures in the end—

As soon as she returned to the easy-going anonymity of the Hub Systems, this other one of their strain would die unborn! The terrible insistence on life on their own terms which Frazer and the Nachief had shown was warning enough against repetition of the nightmare.

Lane caught herself thinking, though, that there had been something basically pitiful about that inward-staring, alien blindness to human values, which forced all other life into subservience to itself because it could see only itself; and she stirred uneasily.

The ventilator in the next office shut off with a sudden click.

"Of course, it will die!" she heard herself say aloud in the silence of the station. *Perhaps a little too loudly . . .*

After that, the silence remained undisturbed. A new contemplation grew in Lane as she sat there wondering about Frazer's mother. **+**

(Continued from page 11)

several rapid exchanges it had become a plan. She chattered with excitement as for a moment they hugged each other through the bars. Then their heads turned in unison toward the two men . . .

"Look at your monks now, Wilmer." Neville wiped sweat from his forehead. "Whatever it was that hit us, it didn't miss them altogether. *Did you ever see such a frightened pair?*"

The biologist stared at the silent creatures. He was still rather green. "I'm ready to go home," he announced finally. "If they're scared, I guess we all are ready to go back."

"No tests, then?"

"Not worth the chance we'd take, opening that airtight again. I'd rather die on Earth!"

"I'm with you all the way on that," said Neville. "Let's blast off!"

Neither man thought it strange that the next thing Wilmer did was walk to the cage, open it, and give the monkeys freedom of the compartment. The virus-coordinated Jackie and Jo-Jo had worked a plan, and its essence was freedom—freedom for self-fulfillment.

Freedom to propagate their kind. . . . **+**

operation Switch



A Short-Short+ by NORMAN ARKAWY and STANLEY HENIG

Illustration by Peter Poulton

Russ put on his disguise and crawled out of the ship. He breathed deeply the cool, clean night air. It was good. The preliminary survey report had not exaggerated when it stated that this world would be ideal for colonization.

His days of waiting, of learning, observing, and searching were over. Tonight he was going to capture the specimen. The man he had selected was, like himself, a stranger in town. He had no family, no friends. He would never be missed. And he would be easy prey, for he prowled the lonely streets long after the whole town had gone to sleep. Tonight his prowling would end.

As Russ neared the outskirts of the village, his receptors received thought-impulses from the inhabitants. Peaceful, steady impulses of a fear-free community at rest; discordant notes of apprehension and uncertainty—mingled messages from the human minds poured into him.

Suddenly, he felt a new, strongly discordant impulse surge upon him. It told of determination, anxiety, fear, haste—all jumbled together in a complex message. His sight receptors picked up a dark form moving slowly toward him. He was right on schedule!

Russ prepared himself for the trap. It was going to be a delicate procedure, for the specimen must be obtained alive and unharmed, and, above all, there must be no disturbance to the peace of the village. The beings of this world must remain unaware of the abduction. They must never know of this visit from the stars.

He edged toward the man who was weaving erratically down the street. In his hand, the man clutched a half-empty whiskey bottle. It was obvious where the missing half bottle of whiskey had gone, and Russ took advantage of the situation in formulating his plan. He would lure the specimen to his ship with an offer of good-fellowship and drink.

"G'morning," Russ said in a slurry voice.

"Hi!" the man answered. He threw his arm over the starman's shoulder and, lifting the bottle to his lips, he took a drink.

"Wash ya got there?" Russ asked.

The man giggled. "Wash it look like?"

The man from the stars grinned and reached his arm out for the bottle. "Gimme a lil drink, buddy. Come on, pal, gimme a drink."

"Sure" the man said, handing him the bottle. "Why not?"

As he took the bottle from the man's hand, Russ allowed it to slip through his fingers and fall, crashing, to the street. He looked sadly at the shattered fragments of glass and the puddle of whiskey on the pavement. "I'm shorry, pal," he said, almost in

tears. "I'm awful shorry." He gazed down sorrowfully. "Sh all right," the man assured him. "Think nothing of it. 'Sh an unpreventable accident."

"No," Russ said morosely. "'Sh my fault. All my fault." He seemed about to cry. Then his face lit up with a sudden smile. "I know what!" he exclaimed. "Come on up to my place and we'll get another bottle." The other man leered approvingly. "Say! 'Sh good ideal!" he agreed. "But you're my guest . . . you gotta come to my place."

"No. I broke the bottle and it's up to me to get another one." Russ tugged at the other's arm.

"Leggo me!" the man demanded angrily, wrenching himself free. "Ne' mind who broke the bottle. You're my guest and I insist we go up to my place!"

Russ started to object again when he saw the weapon in the other man's hand. "I insist!" the man repeated, thrusting the revolver forward menacingly.

"Sure, pal. Anything you say," the starman said.

"Let's go," the man ordered.

They proceeded solemnly down the street, one man in front of the other, the gun between them. Soon, they neared the edge of the town.

"Say, where th' hell you taking me?" Russ demanded.

"Keep going," he was told. "You'll see."

They continued along the road, past the last houses of the town, across a railroad track, and through the open desert country. They had gone a little beyond the town limits when the starman stopped abruptly.

"Come on. Get going," the man with the gun commanded.

But Russ had decided that it was time to reverse the roles of captor and captive. He turned and lunged at his adversary, trying to wrest the gun from his hand. The two men fought, writhing in each other's grip. Confident in his own superhuman strength, Russ had underestimated the power of his opponent. The brief scuffle ended as Russ received a sharp blow on the head and crumpled to the ground, unconscious.

THE MAN pocketed his gun and lifted Russ in his arms. No longer pretending drunkenness, he quickly covered the remaining distance to his destination. Dawn was lighting the sky and he knew that he must hurry.

Depositing the starman's limp body in the special compartment, he went to the control panel and readied the ship for flight. A moment later, the sleek vessel lifted quietly into the morning sky and swiftly took off for home, far away among the stars.

Gor sighed as he relaxed in the pilot-seat. He flipped the switch of the audio-log. "Mission accomplished," he reported. "The human specimen is resting quietly."

space" SALESMAN

by J. P. PHILLIPS

For centuries, salesmen have played an integral part in the commerce of the civilized world. There is no reason to believe that the future with its discovery and pioneering of new worlds will lessen the salesman's presence in the scheme of things. He will have to adjust to strange creatures and stranger environments, but the typical characteristics and tactics of the aggressive salesman today will be no less pronounced in the world of tomorrow, as this story entertainingly points out.

THE OLD man and I lay quietly on the hillside watching the clouds. We didn't have anything else to do . . . we never did.

A rocket trail arced across the sky. The old man stirred, following the trail with his eyes.

"I used to fly a spaceship," he said.

"You don't say," I responded. I've always been diplomatic. There was no point in telling the old bum I didn't believe he'd ever done a lick of real work in his life.

"Yes sir," he said, "if it hadn't been my misfortune to go to Alzar, I might still be a space traveler."

"Izzatso?" I said idly, wondering where supper was coming from. Now that most of Earth's population has emigrated throughout the Galaxy it's hard to find enough people willing to give handouts.

"Yes sir," the old man said again, "if I hadn't had that trouble, I'd still be Agricorp's best space traveling salesman instead of a poor old failure."

I wanted to tell him to save the sob stuff for the paying customers. But I didn't.

"Alzar was a funny planet to have to sell agricultural tools to, anyway," he continued, remorselessly determined to tell the whole tale. "Nothing but limestone, white and gray cliffs of it everywhere, and very little vegetation. The soil had too much lime in it and was pretty rocky besides. Considering the poor farming prospects, I've often wondered why Agricorp sent me to that out-of-the-way stop at all. Of course, the sales manager and I were both chasing the same girl at the time, and maybe he thought he could make better time with me out of the way for several weeks. It took a whole week just to get to Alzar."

"You know where Alzar is, boy?"

"Yeah," I replied, knowing he was off on his story whether I listened or not. Once he got started talking, nothing could dam the stream.

He seemed a bit surprised that I'd heard of the planet, but it didn't stop him.

"Well, then, you know the Alzarians were a pretty civilized bunch," he continued. "Since they didn't have much wood, and no clay for bricks, their buildings were all of cut stone and really made to last. The architecture was rather monotonous, probably because of a scarcity of structural metals, particularly iron and aluminum, which are necessary for tall buildings and unusual designs. Still, their settlements were nice looking—for that matter, so were their women. Prettiest girls you've ever seen. Naturally they weren't exactly like humans, but you couldn't tell it by looking—feeling, either."

"They didn't have any silly taboos about clothing . . . mostly they went nude except for a few ornaments. . . ."

He paused, a faraway look in his faded eyes. It was clear what he was thinking about.

He came back to reality. "Well, like most civilized races the Alzarians were always fighting, usually over nothing. They had developed terrible weapons that were extremely expensive and caused an agonizing death if they hit, although they seldom hit. Living on a world made almost entirely of calcium carbonate, the Alzarians noted early in their history the effect of acid on carbonates. I guess they reasoned anything strong enough to eat away the ground on which they walked would be an excellent weapon. For their principal weapon they had an acid gun that fired hydrochloric acid under pressure and very hot. Their fighting was strictly an antipersonnel operation, since it was much too difficult to destroy their massive stone buildings. Sometimes they used gas to smoke the enemy out of his fortifications, but once out in the open they relied on the acid gun."

"Their wars were comical to watch. Whenever a soldier was touched by a drop from an acid gun he immediately ran to the rear, knowing that long contact with the acid would mean serious injury. Then, after a thorough washing with water he was ready to attack again. The only good thing to be said for the setup was that at least the wars were hygienic."

"Usually the gunners tried to hit the eyes, since a drop of hot concentrated acid in the eye would incapacitate any of them. I imagine it was excruciatingly painful to get hit in the eye. The only shields they had were made of silver, which of course couldn't be used over the eyes."

"When I set my space trader down on Alzar, I didn't intend to spend so much time observing local customs. I intended to do the usual routine demonstrations of my agricultural tools, following up with an order-taking session. The whole business wouldn't take a week if I made the right contacts. Unfortunately the settlement where I was instructed to land was at war with one of its neighbors and the officials were too busy to waste time on me. As I said, I think my sales manager sent me there deliberately because he knew it would be a long time before I could get results."

"However, the girls were pretty and they didn't have anything to do either. For a couple of weeks I had a lot of fun with one of them. One thing about Alzarian girls, they certainly weren't inhibited."

The old man winked at me. Privately I thought he was a bit disgusting but I didn't say anything.

"Finally," he continued, "the mayor—or whatever they called the chief—took time off from the fighting to inspect my wares. While I'd been waiting and watching the war, I'd gotten an idea: what these people needed most were more humane and efficient weapons. Instead of demonstrating farm tools I decided to show them the advantage explosive weapons would have over their hideous acid guns."

"The first rule in the Agricorp Sales Manual says, 'Be resourceful. If you can't sell standard farm tools to nonhuman races, at least sell them something.' That's what I was going to do.

"I rounded up two or three sheeplike beasts that the Alzarians used for food; I assembled the mayor and his council for the show, and I gave my demonstration with a hand blaster that Agricorp had intended as a tree-stump remover. Of course, the blaster took the heads right off the animals as cleanly and mercifully as a man could want.

"I was proud of myself. At least I was proud until I saw the effect of the demonstration on the mayor. He was shocked to the core. I remember thinking, 'Oh, Lord, what crazy tribal law have I broken now!'

"The expression on his face was a mixture of incredulity, horror, and disgust. 'Stranger,' he said, 'you have committed an infamous deed. No person cruel and vicious enough to destroy life with explosives can do business here. Go, before your life is forfeit.'

"I was using an autotranslator developed at

glass before, which wasn't strange since it takes silica to make glass and there wasn't a ton of silica on the whole planet. It was all limestone, all carbonate, no trace of silicate anywhere.

"My bosses thought I should have figured out the potentialities in a silica-free world for myself. You know, Earth has a large percentage of silicon, and where there's silicon there are aluminum and iron. Alzar didn't have that. Before he fired me, the sales manager pointed out fifteen ways I could have profited from the difference.

"I felt bad about the whole episode. It wasn't just my failure that hurt; I really worried about that Alzarian girl I'd been so friendly with. Later I learned that Alzarians don't have babies, they lay eggs. On a planet as loaded with calcium carbonate as Alzar was and considering that eggshells are mostly calcium carbonate, I guess that it isn't too surprising.

"I was mighty relieved. I'd have hated to cause that girl any trouble, even if she did belong to the craziest race in the Galaxy. People that think nothing



"The gunners tried to hit the eyes."

Harvard. Actually, I suppose, the mayor was putting it less fussily in his own language, but I got the idea anyway. I left without a single order. Seems it was taboo in their culture to use explosives."

He sighed sadly. "Then when I came back to Earth and turned in my report, I was fired."

"Why?" I asked. "Just for losing a sale?"

"No. Mainly because I lost a planeful of customers for Agricorp, but also because I missed a golden opportunity, they said. A couple of weeks after I was booted out, an enterprising plate-glass salesman sold the planet a million dollars worth of glass shields. He revolutionized warfare on Alzar because the glass was transparent and acid-resistant and could be used over the eyes. (The last I heard, their scientists were developing hydrogen fluoride weapons to fog the shields with.) It seems nobody on Alzar had ever seen

of throwing acid in your face are not pleasant. I'd hate to die from acid burns, wouldn't you?"

"Yeh," I lied.

There was a pause, each of us thinking his own thoughts.

The old man rose. "Come on, kid, let's find supper," he said.

I got up and followed him down the hill. No use telling him he had a son hatched from an egg. Evidently he knew nothing about the Alzarian son's sacred duty to administer the ceremonial acid to his father when his time comes to enter the Hereafter. It wouldn't be long.

"Craziest race in the Galaxy," indeed! What other race shows such filial piety?

I wonder if there is any market for acid guns on Earth.

EXTRA-TERRESTRIAL



Communication

by **LESLIE R. SHEPHERD,**
Ph.D.

The thought of sending signals to or receiving signals from extraterrestrial intelligences has always intrigued the public fancy. The problem is not that of sending or receiving the signal; the problem is of devising a means or a code that could be interpreted by a distant and unimaginably alien culture. In this fascinating article, Dr. Shepherd has carefully worked out a method of sending messages that might be understood by any non-humans with at least basic scientific development. You will be intrigued by the clear logic of his plan, especially written for SCIENCE-FICTION+.

(Illustration by Frank R. Paul)

THE POSSIBILITY of establishing communication with an intelligent race upon another planet is something which must stir the imagination. In comparison the mere act of setting foot on our airless satellite is of minor significance. If there are such beings on our neighboring solar worlds, then knowledge of the fact may come when man first arrives upon these worlds in interplanetary vehicles. However, the limitless depths of interstellar space may postpone for a thousand years voyages to other planetary systems, and possibly the first intimation of the existence of a technically advanced extra solar race will reach us in the form of feeble radio signals weakened by distance.

The detection of faint signals does not constitute communication, however, and many will maintain that to develop an interchange of radio signals into an exchange of intelligent information would be impossible. What possible medium can exist, between the species who have evolved on different worlds, from which intelligent discourse may be formed? The answer is not difficult to find. The medium lies in the number-concept and certain basic mathematical and scientific ideas, which must be shared by all technically competent species. Hogben, in a recent paper (*Journal of the British Interplanetary Society*, 1952 November), has put forward a number of proposals for utilizing the manipulation of numbers for communication between the Earth and a hypothetical race on Mars.

Technical Problems of Interstellar Radio

THE ULTIMATE limiting factor upon the distance over which we may receive radio signals is the background of noise which exists in very sensitive receivers. This background of noise completely swamps signals below a certain strength and makes detection impossible. Noise occurs at all frequencies, and consequently the wider the band passed by a radio receiver the greater the power of the noise background in that receiver and the higher the strength of the signals if they are to be detected. Consequently the received signal will be stronger with respect to noise if we use available power to send a very narrow-

band signal such as code. For the same power the received signal will be much noisier if we send a broader-band voice signal, and still noisier for the still broader band signals of television.

Interstellar radio communications will probably consist of the transmission of pulses or bursts of electromagnetic energy repeated perhaps once per second. The peak power in a microsecond pulse must be a million times as great as that in a 1-second pulse in order to be detected above the noise background.

Since there is presumably some upper limit, both on the peak power and upon the average power of a transmitter, then it would appear that our interstellar pulses should be of the longest possible duration and repeated at lengthy intervals to ensure detection over the greatest possible distance.

To increase the range, the transmitting and receiving arrays will probably resemble the so-called radio-telescopes, in which the antennae are situated at the foci of great parabolic metal meshes.

The particular virtue of such huge arrays is that they enable the transmitted signals to be concentrated into very narrow beams (in the manner of a searchlight beam), while, used at the receiving end, they collect the radio waves falling over a very wide area and concentrate them onto the receiving antenna. The beams are much "tighter" if we go to very low wavelengths, but receiver noise increases sharply in the "centimetric" range and offsets much of the advantage in their employment. A disadvantage inherent in the use of tight beams and large receiving "telescopes" (which have a very narrow field and only see a small region of the sky) is the improbability of transmitting and receiving arrays being directed in the correct directions at the correct time; and the chances of establishing interstellar contact in the first instant is remote.

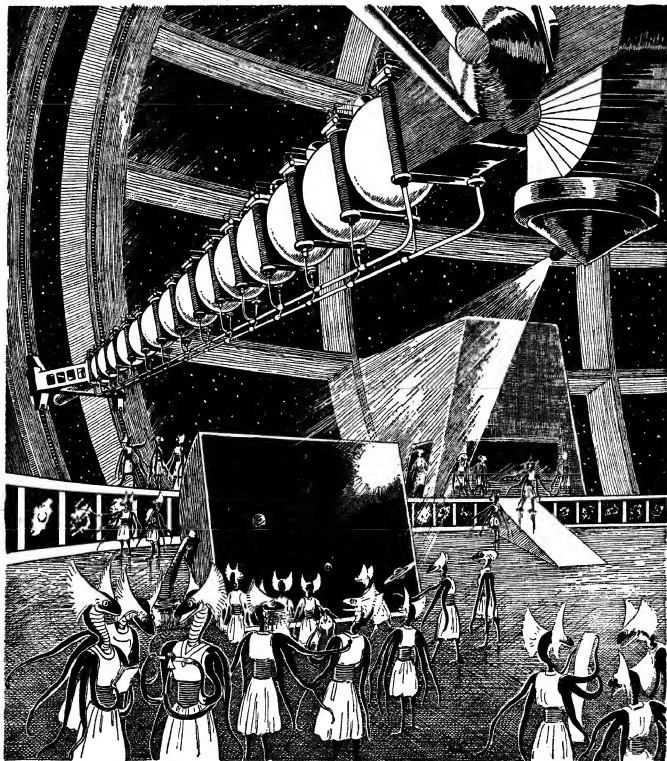
To illustrate the possibility of receiving interstellar radio signals of detectable strength, a few figures are given here. Assuming that long pulses of about 1 second are being transmitted, the bandwidth is about 10 cycles. The limiting signal power that can be detected above the noise with this bandwidth and at a

wavelength of say 30 centimeters will be of the order of 10-18 watts (one million million millionth of a watt). Assuming that the transmitting and receiving arrays are as large as the Jodrell Bank radiotelescope, then the peak power at the transmitter will need to be 40 megawatts to cover a distance of 10 light years. If only one pulse is sent every 10 seconds, then the average power of the transmitter is 4 megawatts.

These figures illustrate that the transmitting power involved, is almost within present-day capacity. If much larger area arrays at the transmitter and receiver are considered, the power requirement could be brought down well within the reach of u.h.f. generators which exist today. However, the likelihood of ever detecting a transmission coming from an unknown direction, with a mere 10-cycle bandwidth, at a frequency of 1,000 megacycles, would be virtually nil. It

is much more likely that pulses of about 1 millisecond duration would be employed with a 10-kilocycle bandwidth, so that the peak power of the transmitter or the areas of our radio-telescope reflectors would have to be pushed up accordingly. In addition we would want to send pulses of various sizes at a rate more rapid than 1 in 10 seconds, the largest being many times greater in power than the minimum detectable above the noise, pushing the necessary peak and average transmitting power still higher.

Obviously interstellar radio communication would be a difficult proposition technically. Signals would be limited to simple pulses sent at a rate of perhaps 1 per second, and the size and duration of these pulses could be varied only within narrow limits. Any system of communication would have to be developed around these rather restricting circumstances.



"Hypothetical intelligences of Vegan planet, communicating with Earth"



Leslie R. Shepard, Ph.D., long a well-known figure in rocketry circles, particularly in Europe where he is technical director of the British Interplanetary Society, has been making a new reputation for himself by his carefully worked out articles in Science-Fiction.

Establishing Contact and the First Steps

IN ORDER to facilitate this discussion, let us suppose that there exists an intelligent race which has evolved upon a planet revolving about the bright star Vega. Assume this species is sufficiently advanced technically to possess radio and sufficiently enlightened to decide to use this medium in an attempt to seek out other races in the universe; has set up a fairly large number of transmitters, and has systematically beamed radio signals in the direction of various likely stars.

Some idea of the initial problem facing the Vegans will be gathered from the fact that the number of stars within a radius of 100 light years numbers about 10,000. Consequently, unless they possess a vast number of transmitters, or have advanced knowledge about the possibility of habitable planets existing around particular stars, then they must ration the amount of time devoted to each star. In fact, the odds are such that we on this planet might spend a hundred years diligently probing the skies with our radio-telescopes before we might happen to point them in the direction of Vega at just the correct time and tuned to just the right frequency band to pick up the signals.

Our first step on receiving the Vegan signals is to set up a transmitter of the greatest possible power and transmit radio signals back at the same frequency. It is rational to choose the same frequency that the Vegans are using, since out of a vast range of possible frequencies (from about 10 megacycles up to 30,000 megacycles) this is the only one which, so far, has any significance. *Since the star Vega is 26 light-years distant, 52 years will elapse before we know that the Vegans, in their turn, are receiving our signals.* In the interim we might not consider it worth while to attempt to develop communication other than to introduce certain characteristic pulse combinations or "words." The most important of these will be a call sign and time signals. If we are sending pulses at a repetition rate of about 1 per second, then these themselves might define time intervals, but at intervals of one hour, one day, and one year, we should transmit a pulse word which in due course the Vegans will learn to identify with these time intervals. The definition of time intervals in this way is a most important basic step in the development of our inter-stellar language. The call sign will occur only whenever we commence transmission after a shutdown. It will have a certain value as a symbol identifying ourselves.

The first sign that the Vegans will have received our signals, which will follow after 52 years, will be marked by a change in the nature of their transmissions. If for example, they have been devoting only a small portion of their time to transmission to us, then, once they have detected our reply, they will obviously throw in a full-time transmission to strengthen the bond of contact, and instead of detecting their signals at infrequent intervals, we may now find them coming through more or less continuously. At any rate we may be sure that they will have some definite means of acquainting us with the fact that we have contacted them.

Before considering deliberate attempts to exchange intelligent messages, it is worth noting that certain natural information is inherent in the radio waves which we are transmitting and receiving. As our planet revolves about the sun it moves first nearer to and then farther from Vega, repeating the process once every year. As the Earth moves toward Vega, the frequency of our radio transmission will appear to the Vegans to increase, while as the Earth recedes, the frequency will appear to decrease. This effect (the Doppler effect) might enable the Vegans to deduce the length of our year (it is unlikely they will be able to observe the Earth directly by optical means). Assuming that they have a reasonable knowledge of astronomy, they will know the mass and size of our sun and be able to deduce the size of the orbit of our planet. These data will serve the useful purpose of providing the Vegans with confirmation of their interpretation of information which we shall send them later. We shall of course obtain similar information concerning the planet upon which the Vegan transmitter is situated, unless we happen to be situated near the axis of the orbit. The Doppler effect could also, in principle, be used to establish the period of rotation of the planets and so confirm the significance of the day-time signals.

The Vegans

WE DO NOT know what manner of creatures the Vegans are. Their chemical constitution may differ radically from our own. In physical form they may bear no resemblance to any creatures upon our world. Their senses and methods of communication with each other may not necessarily be anything like our own, and language as we understand it may not exist. All these possibilities may promote extreme pessimism over our chances of establishing any sensible exchange of information and ideas.

However, we may have basis for assuming that the Vegans are accomplished in the field of electronics and must therefore possess considerable knowledge of physics and mathematics. They may have a useful experience in the field of chemistry too. This is essential in the design and construction of the complicated impedimenta required for an interstellar radio network. Obviously they must also be keenly interested in astronomy, otherwise they would not have embarked upon the present venture. In the development of our radio language therefore we can safely draw upon basic ideas in these sciences to demonstrate the meaning of our words and symbols. Above all, the fact that two and two make four, is universally true and will be as obvious to the technically competent Vegans as it is to us, so we can utilize simple number manipulations to develop much of our interstellar vocabulary.

We must make use of numbers, either pure numbers, or numbers whose relationship has some physical astronomical or chemical importance, to demonstrate the significance of words. The Vegans may not use words to convey ideas in their own everyday transactions; they may have a system of communication much more advanced than any terrestrial language. Nevertheless, we may be confident that the meaning of our words or the ideas which they are intended to convey will not be lost upon Vegans, provided we illustrate them by unambiguous means.

Certain words, the time-words—hour, day, and year—have been demonstrated to the Vegans, as already explained, simply by their direct use and by virtue of the fact that *time* is a physical quantity which enters directly into our transmissions. The next words which we will introduce to the Vegans will be demonstrated by simple number manipulations. These words will

convey the ideas of addition, subtraction, multiplication, division, zero, fractions, negative numbers, and the concept of identity. The method adopted is that which Hogben has proposed, namely, the performance of simple sums, e.g.,

$$2 \times 2 + 2 = 6$$

which in our transmission takes the form of two pulses; space; a combination of pulses denoting plus; space; two pulses; space; the pulse combination "plus"; space; two pulses; space; a pulse combination denoting equality or identity; space; six pulses. The other words or concepts that we have mentioned can be demonstrated in a similar manner.

Two important concepts, those of affirmation (yes, correct) and of negation (no, wrong) can also be introduced by means of these simple sums, by using them as labels for sums that have been worked correctly or incorrectly. Of course, we shall require to use these and most of the previous words in much wider senses, later on, but the scope of any word can be widened gradually, so that the Vegans can understand any new significance, which might be attached to it, by referring back to its previous use and original definition and attempting to draw analogies.

In the course of our transmissions, we shall need to use very large numbers. Obviously we cannot continue in the simple manner which we have employed above. To do so would mean that a number such as 30,000,000, for example, would take a whole year to transmit at a rate of one pulse per second. A more compact system must be utilized. The decimal system, which is in common use, is very convenient in that it is extremely compact, but unfortunately it involves ten different digits and would consequently call for that number of variations in the size or duration of pulses used. The technical difficulties make this undesirable.

The use of a *binomial system* would be better, since it involves only two different digits, zero and unity. The zero pulse could be a half-size and unity a full-size pulse in our interstellar telegraph code. One disadvantage of the binomial system is that it requires approximately three times as many figures as the decimal system to represent any given large number. The following table illustrates some numbers in the binomial system:

1=1	5=101	16=00001
2=01	6=011	64=0000001
3=11	7=111	1000=0000101111
4=001	8=0001	

The argument in favor of having only two types of digits for number representation will also apply to the construction of words. Morse code, of course, utilizes only two pulses, distinguished by difference in duration rather than height. However, Morse merely codes the individual letters of existing words and would be unnecessarily cumbersome in the interstellar telegraphy. Since the Vegans do not know our Earth languages, we might as well start from scratch in constructing words. Accepting, as in the binomial system, only two types of pulses, distinguished from the digits by having slightly different height and duration, we can regard these as a two-letter alphabet and build our words from two different letters.

In the interest of having to transmit only the smallest possible numbers, we must from time to time teach the Vegans to convert from one unit to another of different magnitude. Thus, if we have illustrated the significance of a mass of one ton, we should use this to introduce smaller units, such as the pound, or, if we are using the metric system, the gram. Actually, we might start from the beginning and build up a binomial system of weights and measures to fit our

chosen number system. A simple conversion table relating the time units, year, day, hour, second, should be transmitted in the early stages of our transactions, both to confirm the relationship which the Vegans will have noted already, and in order to introduce small units like the second, which could not be conveniently included in the time signals.

The concept of frequency must follow very closely the initial lessons on time and number, since it will have considerable application. The radio frequency of our signals will provide the necessary example to illustrate our meaning. If we are transmitting at a thousand megacycles, then, following our call sign, we shall always add the message:

Frequency 1,000,000,000 in 1 second.

The Vegans will soon interpret the words "frequency" and "in" used in a restricted sense, for the frequency of oscillation of our signals is quite fundamental, once the time unit is defined.

The pure number "pi," the ratio of the circumference to the diameter of a circle, can be used as a starting point of a discourse on geometry, which will be essential when we come to discuss the solar system with the Vegans. We can begin by defining pi in terms of a numerical value, thus:

$$\text{Pi} = 3.1416 \text{ divided by } 1,000$$

(since this is not exactly so, we must have to introduce a word approximately, but this would present no great difficulty). The Vegans will be well aware of the significance of this number and it will be quite safe to proceed with the use of pi to introduce other words e.g.

Circumference equals pi times diameter

Diameter equals two times radius

Circle: Area equals pi times radius times radius

In this way we can also introduce the words "sphere," "surface," "area," "volume," and even proceed with a discussion of other geometric forms such as the square and cube, by the process of defining volume and area in the terms of lengths of sides.

Sun, Earth, and the Elements

EARLY in the proceedings, we shall need to establish names for our sun and the Earth. One possible method of identifying the sun is to refer in some way to its spectrum. The frequency at peak emission, of the light of the sun, is 640 million million per second. We might try this as a means of identification, thus:

Sun: Frequency 640 million million in one second.

Then we might try the same method of identification for Vega, thus:

Vega: Frequency 1,200 million million in one second.

While these statements do not positively identify the two stars, they provide a strong clue which should not be lost on the Vegan astronomers. Later usage of the words will confirm the meaning beyond doubt. One possible additional clue, introducing a word for electromagnetic waves (radio, light) would be contained in the signals;

Radio: Sun to Vega: 26 years.

This might also prove a starting point for our discussion of the solar system, in particular the Earth, for we may send a signal;

Radio: Sun to Sun•Planet 3: 8 minutes.

This provides a means of identifying our planets, for the Vegans will know the period of the Earth in its orbit and therefore the radius of the orbit. In any case we will not leave it at that, for we may

make use of the elementary geometry lessons which have gone before, to introduce words for orbit, period, and units of length. For example:

Sun Planet 3: *Orbit period* equals 1 year

Sun Planet 3: *Orbit radius* equals 150 million kilometers

and then:

Sun to Vega: *Distance* equals 220 thousand million million kilometers

This signal helps to confirm the identification of Sun and Vega and the magnitude of the kilometer.

We have now a sufficiently comprehensive vocabulary to discuss the diameter, surface area, and volume of the sun and the Earth and of Vega. The sizes of the sun and Vega will of course be known to the Vegan astronomers, but the data about the Earth will be new to them and will represent the first fruits of the transactions. Data can also be sent regarding the other planets and satellites of the solar system.

Mass might be considered as the next concept to introduce, and this may be done by sending two signals, the first being

Sun: *Mass* equals 2,000 million million million million tons

and the second giving the same data for Vega. It will not be difficult for the Vegan interpreters to identify mass, and the ton unit from this. Other mass units may be introduced in a conversion table and similar data given for the Earth and the other bodies of the solar system.

So far we have confined ourselves to purely physical and mathematical concepts, but soon we must widen the field to include chemical and biological data. One of the first steps in this direction involves the introduction of the chemical elements and the atoms and isotopes of these elements. Fortunately, number language is particularly applicable to the chemical elements. The fundamental numbers of the various isotopes are (a) the atomic number (the number of protons in the nucleus) and (b) the mass number (the total number of protons and neutrons in the nucleus). It is worth noting that chemists use these numbers (actually atomic weight was used rather than mass number) long before nuclear physics revealed their true significance. It is inconceivable that the Vegans, who are able to send radio signals across 26 light years of interstellar space, should be ignorant of these numbers. First, we might list the stable isotopes of all the elements, for example

Isotope-1. Element-1: Atomic Number 1.
Mass Number 1.

Isotope-2. Element-1: Atomic Number 1.
Mass Number 2.

and so on. The significance of the table and the meaning of the new words will probably become apparent to the Vegans when they have the complete list and subsequent usage will confirm this. Next, we may introduce the atomic concept, making use of the actual masses of the atoms and the units previously defined, in signals of the following type;

Mass Atom. Isotope 1, Element 1. equals 1 divided by 600 thousand million million million grams.

This should be sufficient to identify the word atom and confirm the significance of the terms isotope, element, etc.

Following the introduction of the chemical elements, we can signal information about chemical reactions and introduce chemical compounds, e.g.

1 Atom Element 1 plus 1 Atom Element 8
equals 1 Molecule Compound 1.1.8.

signifying that two atoms of hydrogen combine with one of oxygen to produce a molecule of water. Here again, the true significance of molecule and compound will become apparent when a number of examples have been given.

The various states of matter, solid, liquid, and gas can be introduced at this stage by reference to particular elements. At the same time we can introduce a scale of temperature in the following manner (we have chosen here the absolute Kelvin scale, according to which water freezes at 273 degrees);

Temperature 274 Degrees. Compound 1.1.8.

Liquid

Temperature 272 Degrees. Compound 1.1.8.

Solid

and so on, giving a large number of examples to confirm the meanings of the words. We may augment this information by giving the surface temperatures of the sun (6,000 degrees) and Vega (11,000 degrees).

Our vocabulary has now been extended sufficiently to describe the constitution of the sun, of Vega, and in particular, of the Earth. We may say what proportion of the surface is solid and what proportion is liquid, identifying this liquid as water. The fact that the surface is covered by gas, is easily conveyed in our simple telegraphic system, and words like land, sea, and atmosphere can be defined. The constitution of our atmosphere can also be described so that the Vegans now have a fairly close idea of the environment of their telegraphist acquaintances.

Man, Life, and History

OUR treatment of the chemical compounds will take us eventually into the field of organic compounds and so to the discussion of biology. Special emphasis might be set upon molecules which form the vital bricks of living tissues, and in connection with these we can introduce the words *man* and *life*. This we can do by analogy, giving, first of all, a list of the constituents of the sun and then of the Earth, then giving a list of appropriate organic substances and labeling them man.

The relationship between man and life might be established by analogy. Thus we may signal as follows:

Land has property Solid.

Sea has property Liquid.

Man has property Life.

We can establish furthermore, with our existing vocabulary, that man has a temperature of 310 degrees and that this is higher than the surrounding temperature, so that the Vegans will appreciate that man generates his own internal energy. We can indicate the volume mass of man, and do this against a time table of years, thereby introducing the concepts of growth and maturity and also giving a measure of life-time. That growth is a property of life can be demonstrated by the analogy method. Other creatures like dog, cat, and horse can be introduced by means of growth tables and the generic significance of the word *life* can be emphasized by associating it with all these things.

The next step might be devoted to a demonstration that Sun Planet 3 is the abode of man and that the other planets are not. Thus we might signal:

Man on Sun Planet 3: Yes.

Man on Sun Planet 1: No.

If by this time we have interplanetary flight, we might add dates to indicate how long man has been on the moon or Mars. Dates in the past can be represented in a simple way by negative numbers of years and the history of life on the Earth can be discussed now in a rudimentary manner, by such phrase as:

Minus 1,000 million years: Life on Sun

Planet 3: No.
Minus 100 million years: Life on Sun
Planet 3: Yes.
Minus 1 million years: Man on Sun
Planet 3: Yes.

Limitation on the physical conditions under which life can exist, temperature, presence of water and oxygen and so on, are well within the scope of our language at this stage, if we make use of the words "yes" and "no" to indicate which conditions are permissible and which are not.

Facsimile

WE HAVE demonstrated thus far how it is possible, starting from simple ideas of time and number and proceeding through universal laws and facts of science, to build up an exchange of information which includes complex concepts such as life and historic sequence. The items we have detailed represent only a small proportion of the subjects on which discourse would be possible. In fact, what we have seen is the process of building a language upon a sophisticated framework of science and mathematics, rather than upon a primitive framework of everyday life. Nevertheless, there is something lacking in our method, which is present in the more primitive language development. This is our inability to point to objects in order to establish their identity and to illustrate words by actions and by pictures. Above all, it is almost impossible to discuss shape, except in simple geometric cases, in the medium which has been described so far. The thing that is needed is a method of two- or three-dimensional representation which will provide us with a means of illustration, more powerful than number manipulation.

It might be argued that the Vegans may not possess vision and, if not, they will not appreciate two-dimensional representations. Vision, in the last analysis, is the ability to detect electromagnetic radiation over a certain range of frequency, to differentiate between frequencies (color), and establish the strength of the signal (brightness), and above all to determine the direction of the sources of the radiation with considerable resolution and set out these sources in a pattern within the mind. The radiations which we detect are those which predominate in our surroundings and we may regard it as an inevitable process in the evolution of life, that we have developed the vision sense. It would be surprising if the Vegans had not developed a similar sense, to much the same degree as the creatures that live on the Earth, and even more surprising that they had advanced technically without it. However, even if they are blind, they must have some compensating faculty that would serve much the same purpose and allow them to perceive objects in their correct position and form. This being so, it can be assumed with confidence that the Vegans would appreciate diagrammatic or pictorial representation, if we could transmit it to them.

The impossibility of interstellar television need not bother us. In any case, television is a system which involves such peculiarities as the human tempo of life and persistence of vision, characteristics that may be radically different for the Vegans. Facsimile telegraphy is all that is required, and even at a slow rate of one pulse per second, it should be possible to transmit facsimile signals which will enable the Vegans to build up two-dimensional illustrations once they have appreciated the purpose of the transmissions. The identification of facsimile should present no great difficulty

to a race with any real measure of intellectual ability. The Vegans should soon learn to place the correct interpretation upon the transmissions.

Ideally, facsimile should consist of almost continuous unspaced pulses, the height of which will indicate the brightness of a spot on the diagram or picture. Bearing in mind the technical difficulties of interstellar telegraphy, however, this might prove impossible, in which case we should send the short-duration, long-spaced pulses of the earlier telegraphy system, and leave it to the Vegans to discover the correct manner of reproduction. The most difficult step for the Vegans will be the initial one of discovering the fact that the signals represent an array of spots and the method of scanning. We can make this task easier for them by reference to simple geometric concepts previously discussed. Thus our first transmissions can represent circles, triangles, and so on, and we might prefix the facsimile by some clue to the array and the object represented thus:

Circle on square 50 times 50.

This, followed by 2,500 pulses, does not require any giant feat of intellect to interpret. At first the transmission may be in black and white, i.e. involving pulses of two heights only, one just above the noise level and the other type as high as possible. Later, we might increase the variety of pulse heights to introduce degrees of shading. In both cases we might indicate to the Vegans the degree of brightness involved, for brightness is a physical quantity which we could easily introduce as a by-product of our discourses.

Having established the principles of facsimile, we should be able to extend our field of communication immeasurably. We should be able to compile for the Vegans a pictorial encyclopedia of things and events in our world which would enable them to obtain a comprehensive knowledge of our planet. We could even demonstrate the correct tempo of various actions and processes by means of animated sequences with time labels on successive pictures and in the same way, improve upon our more primitive history lessons with pictures showing the time-scale of evolution and the development of man. Facsimile would not of course, replace the more primitive form of telegraphy, but help turn it into a mature and expressive medium.

Time and Telegraphy

THROUGHOUT our transactions with the Vegans, we should be "listening" to beings, who had just been receiving messages from our grandparents, and "talking" to Vegans who would be about to send information to our grandchildren. The posing and answering of questions in the normal sense would be impossible. Most of the time, particularly in the early stages, we should be striking ahead without being really certain that the Vegans 26 years hence would understand our messages. However, it is fairly certain that while we were making our initial attempts to transmit information, we should also be receiving the first attempts of the Vegans to do likewise. If we found that we could interpret their messages, then it might be better, after all, to leave the initiative with them and work according to their system. This would at least avoid the complication of building up a duplicate interstellar language. In all probability the Vegans' method of approaching the problem of communication would differ greatly in detail from the one which we have outlined, for it would be colored by their psychology and their own peculiar method of conversing with each other. However, we may be sure that the essential framework of numbers and Nature's laws would be there to guide us. +

CHAIN REACTION



AS THIS ISSUE's Chain Reaction is being written, the October, 1953, issue of SCIENCE-FICTION+ has been on sale only a few days, yet letters and telephone calls are already flooding in, greeting all aspects of the issue with heartening enthusiasm. One thing certain beyond any doubt is that Frank R. Paul has added new laurels to his already star-studded reputation. Just turned seventy, he is unquestionably at the peak of his ability. The introduction of Virgil Finlay to our pages was cheered by many who felt that he was doing some of his finest work for us.

The new book paper was universally acclaimed. The readers found that the pages were easier to handle, the type more readable due to less glare, and that the bulk lent an indefinable atmosphere and personality to the magazine.

Delight was expressed over the return of Thomas Calvert McClary to science-fiction, and some doubts were voiced that we could duplicate as stellar a line-up of great authors in the future as we did in October. Well, we are not letting up the pace. This issue brings back the master, Harry Bates, with a short-novel that in addition to its quality bears only one thing in common with his previous stories: it is one of the most unusual, off-trail science-fiction stories ever written. We've added James H. Schmitz—author of "Witches of Carres" to our roster, as well as bright newcomer Frank M. Robinson. We also brought back for a repeat stellar headlines such as Murray Leinster and Eric Frank Russell.

We said in our August, 1953, issue that if there were no good short-stories available we would buy none, and if there were more than one, we would buy as many as we could get. Four writers new to the field make their debut with short-stories this issue!

In the last issue we added Virgil Finlay to our art staff. In this number we bring you L. Sterne Stevens, better known to science-fiction lovers as Lawrence. Thus the three greatest story illustrators in science-fiction today, Frank R. Paul, Virgil Finlay, and Lawrence, will appear every issue.

IT IS ALWAYS a risky business to predict the future, especially since projected stories don't always work out, but subject to reservations, we've got some fine material developing. We're hard at work on Nat Schachner, one of the former leading science-fiction writers, and now a prominent historian.

Some great sequels are in prospect. Thomas Calvert McClary is putting together a sequel to "The Celestial Brake," based on a splendidly human concept. Clifford D. Simak will have a follow-up story to "Spacebred Generations" which has the possibilities of a science fiction classic. Harry Bates has said something about a terrific continuation of "Death of a Sensitive" and we're giving him every encouragement. Philip José Farmer says to expect a good one from him shortly. We already have on hand and scheduled for our next

issue a fast-paced, science-adventure short novel, crammed with new ideas and human interest, by the old master Murray Leinster.

Many old-time readers have asked us to try to get Elliot Dold, unique and well-remembered science-fiction artist of the past. We've been in correspondence with him, but unfortunately he has been ill, but when he has recovered sufficiently we'll try to obtain at least a few illustrations from him.

Donald A. Wollheim reports that he is editing a new science-fiction anthology for McBride, containing one great story from each of the leading science-fiction magazines that has never been anthologized before. He may use "Death of a Sensitive" by Harry Bates in that collection. Philip José Farmer's short novel "Strange Compulsion" from our October issue will be included in a forthcoming anthology *Prize Science Fiction*.

SCIENCE-FICTION+ also continues to be the only science-fiction magazine whose art-work is consistently displayed and reprinted. Lloyd Mallon, capable editor of the remarkable Fawcett Publications book *The Mystery of Other Worlds Revealed*, is compiling a new book, to be composed of outstanding articles and fiction on space travel. From SCIENCE-FICTION+ he has obtained rights to reproduce some fourteen of our interior illustrations by Frank R. Paul, Tom O'Reilly, Charles Hornstein, and others, in addition to three of our covers. Outstanding among these will be the complete color reproduction of the "Our Atomic Sun" cover by Paul from our October, 1953, number. "Interstellar Flight" by Leslie R. Shepherd, Ph.D., from the April, 1953, issue of our magazine will also be included, along with an article by Hugo Gernsback.

AMERICAN INVENTORY, from New York's Museum of Modern Art, utilized Tom O'Reilly's lead illustration for Simak's story, and Paul's drawing of the moon from "The End of the Moon," both from our August issue, for display on a television program on space-travel, which was written and compiled by Murray Leinster.

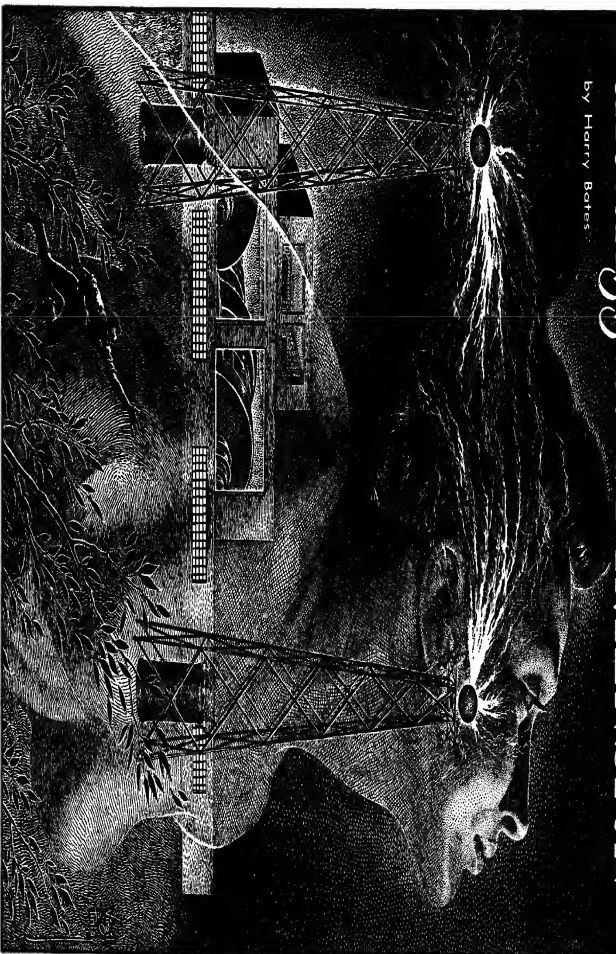
Of special importance, too, is the fact that readers complained that our former type-style (Bodoni light) printed too dark on the new paper. So we have changed over to the more suitable Baskerville type, which is especially designed for printing on book paper. In addition to the greater legibility, 3,000 to 4,000 extra words have been added to the magazine—equal to an additional short story—as a bonus to our readers, at no extra cost in money or eyestrain!

The editorial staff is working hard to merit your continued support, and to make SCIENCE-FICTION+ the science-fiction magazine you've dreamed about. If you like what we have been doing, won't you pass the word on to your friends that they are missing something if they haven't read SCIENCE-FICTION+? +

Sam Moskowitz

the triggered DIMENSION

by Harry Bates





Harry Bates is well known to all SCIENCE-FICTION+ readers for his remarkable story "Death of a Sensitive," which appeared in our May, 1958, issue. He is even better known to the general public as the author of "Farewell to the Master," the fine story from which the motion picture "The Day the Earth Stood Still" was made.

The past one hundred years have seen more scientific progress than the preceding ten thousand years. Specialization has become necessary, since no one man can any longer absorb complete knowledge of his subject. A point is already being reached where the elements of each new advance have become so complex that it is difficult for us to visualize all the factors that go into future developments. Human beings seem to be moving toward a condition where they will not be able to comprehend or understand new phenomenon before them, even though their science and mathematics may prove their existence. Harry Bates, sensitively perceiving such an eventually impending situation, has written a human and moving story on a theme calculated to make you think.

(Illustrations by Virgil Finlay)

I

WE ALL KNOW NOW it was something new that happened two weeks ago in that lonely field out on Long Island.

Some of us are frightened. A great many of us are shaken and bewildered. And why shouldn't we be? The four dimensions of space-time have betrayed us. They were unstable all the time, and now the impossible has occurred.

Extra dimensions have long been abstract concepts used by mathematicians, but what a shock to find they may have reality! What a shock to learn that the symbols can strike and kill! And kill so fantastically!

Never has there been such hush-hush. Earth's top scientists swarm over the fatal area, and we're told nothing. I say *we*. I am an electrical engineer at the Wilson Laboratories where it happened; I've been employed there since my graduation in February and I still draw my salary; I was sole witness of the first wonder and the major witness of the third—but they don't even let me on the premises. Having given my facts, I haven't any present use. I'd only be under their feet. So—while I know the general setup at the field, and know a good deal about the lightning experiments which were performed there, I know no more than you of the dimensional experiments now going on.

Nor do I know any more than you the explanation of what happened.

I do know, and I alone know, the complete story of the impact of the New Thing on *one human being*, and I am telling that story here.

You've read the names of the victims. Mary Sellers I knew since childhood. I grew up with her husband Tom, and was his best friend. I was right on the field with them at the moment of Mary's fantastic death, when the Unknown first struck.

It was about nine-twenty in the evening, and very still and lonely. A full moon showed clearly all the larger details of the area. Several hundred yards to the west, in the direction of New York City, lay the cluster of buildings that comprised the indoor part of the Wilson Laboratories. Between lay the field used in the outdoor experiments—a rectangular area of about 80

acres, once field land, now a level surface of weeds irregularly furrowed with deep trenches. In a great oval stood a half-dozen high latticed towers, and in the center of them two greater towers—the area of mystery. I may not give any further details. The field was circled by a high woven-wire fence posted at intervals with out-facing signs warning: KEEP OUT. LIGHTNING EXPERIMENTS. DANGEROUS.

When it happened I was standing on the lip of a trench in the eastern end of the field. Below me in the trench ran a new, experimental type of electrical conductor. Thirty yards farther away two electricians were at work in the trench farthest east, the tips of their heads sometimes just visible above the lip. These men were making alterations at the conductor in that trench.

Tom and Mary were standing in the field twenty yards or so from the men in the trench, and between them and me. They were talking in low tones. I couldn't hear their words, but from their manner I had the impression there was a stress between them; not quite a quarrel, but a difference. I saw Tom turn away, Mary circled him in the moonlight as if insisting on looking into his face; he kept turning away. Then, after a moment, she left him.

She walked straight westward across the field to the next trench, turned and for a moment looked back at him, crossed the trench where it was bridged by heavy planks, turned again momentarily toward him, then continued on the footpath across the wide level beyond. Tom stood watching her dwindling figure. When Mary reached a place between the two central towers she turned once more, for the last time. She raised her arm high and waved. I saw her clearly. Tom remained motionless, only looking. She dropped her arm. For just a second the two stood thus, one terrible second, while space-time coiled about Mary to strike that initial blow so unexpected and so fantastic . . .

I HAD BETTER tell you certain things about Tom and Mary.

The three of us grew up together in the little Long

Island town of Big Pond, two miles east of the Wilson Laboratories.

Tom and I, as boys, were inseparable. His father had a duck farm on the edge of town. The farm was our inexhaustible playground. Every day saw us engaged in some new enterprise of burning importance—making bows and arrows for shooting starlings (I don't remember that we ever hit one)—digging for Indian skeletons (which we insisted were *not* sheep bones)—building board boats for venturing out among the great flotillas of ducks—and other activities, many others. Mary lived nearby, but she was no pal of ours in those days. As that peculiar creature called a girl, different, inferior, a sissy, we found her of use only for the occasional amusement of pigtail jerking. The mere threat of that kept her well away from our arenas of proper masculine action.

When Tom was about eight his father gave him a horse. He at once named it Pinto and always called it a "him." (Pinto was no *pinto* at all, but a red roan, an ordinary farm horse, and a mare at that.) From the moment Tom first climbed to her back via the fence, it was no longer Tom and me who were inseparable, but Tom and Pinto; the two ranged all over that end of the Island. Tom wouldn't let any of us other kids ride his horse, for he'd say we didn't have the experience—Pinto being a wild mustang, dangerous to everyone except himself.

Only once did I ride Pinto. I had had an everlasting fist fight with Tom. He was in the wrong, but impetuous as always he had come at me, fists flailing. That evening Tom's father explained things and sent Tom to ask my pardon. He did it forthrightly, crying while he spoke—and the next day he came galloping to my house and insisted that I take a ride on Pinto, to make amends. It was his utmost gesture.

The adolescent Tom was too restless to be good at book learning, and after high school he became an apprentice electrician, later getting a job at Wilson's. I continued through college, graduated as an electrical engineer, and became employed by Wilson's. While I was still in school Tom's father lost his farm, then died, so Tom went to live in the town. He stabled old Pinto in the garage of an empty house at one end of town and pastured her in a piece of land in back. He walked to and from work, or got lifts.

Then, one day, Tom looked at Mary and saw her in a new way. She had somehow become a different Mary—someone new, withdrawn, mysterious, with sudden power to make his heart beat wildly. He courted her in his usual impetuous way. They married and rented the little house in the garage of which Pinto was stabled. Crazy happy, he carried the new Mary over the threshold of the little house into a new life. That was a year ago. There came a time they expected a child—and I have never seen a man so happy and proud.

AT WILSON's a new series of experiments were beginning, and on the fatal night Tom was working overtime in the field. I was in the main building when the watchman phoned, saying Mary was there. I found she had ridden over on Pinto with coffee for Tom. She was in a wonderful mood! She glowed with happiness. I myself took her to him. From a distance she called to Tom, and I saw him appear above the trench and come toward us. I hung back, thinking to be tactful.

From a short distance I stood and watched them. They embraced and spoke. I felt there was a stress between them. I saw her kiss him on the back of his neck when his head was turned. He wheeled and spoke

to her sharply. She seemed to accept defeat and left him, making for the footpath across the field, and turning twice to look back. Between the high central towers she turned for the last time and waved, but Tom did not respond. She lowered her arm, and for a second stood motionless in the moonlight, looking at him. It was at the end of that second that the New Thing happened and Tom's life was blasted.

From the place where Mary stood there sounded a slight c-r-a-c-k, and a foglike cloud appeared in the air. It dissipated quickly, but the body of Mary was no longer there.

Tom and I from our separate positions stared. An ambiguous mass hung where the body of Mary had been; very slowly it seemed to grow. I watched it in consternation. I saw it as roundish; it seemed to rotate, for the reflections from its surface changed in the moonlight. I found myself moving toward it, and Tom was doing the same, and we came nearer. I felt that Tom, like myself, was terribly excited, but neither of us said anything; we only stared and moved forward.

The object steadily grew larger, and I realized it was traveling in our direction. I reached out and grasped Tom's arm, stopping him, and together we watched it approach.

Suddenly we recognized it. I'm sure my hair stood on end. Stiff, dumbfounded, we watched the object come. It was a head with an indistinct vapor-like body!

My eyes told me the object was Mary's outline! It was alone and unattached. It didn't fall. It floated toward us, eight or ten feet from the ground. The head looked solid and substantial. It came on slowly, sometimes wafting a foot or so higher, sometimes that much lower. It reached us. It passed us. As I turned I saw that Tom stood bent, knees and body. Never could there have been a man so stricken. Still he did not speak; but he was making noises in his throat.

As the object passed us it was rotating a little and the moonlight fell full on the face. It was Mary's face. Just as it always was, except that now it was blank, without expression. But it was somehow alive! At that moment the eyes, which had been closed, opened! I think they may have changed direction, but they didn't look at us. They seemed unaware of us. The face was tilted upward, and the eyes pointed at the stars.

With a terrible sob Tom moved forward. Never changing speed or direction, the object floated away. We followed it. Tom was panting now, but he still said nothing. We were only a few yards behind when it reached the east fence.

It passed *through* the fence, never pausing, but idly floating straight ahead.

We jumped and for a moment stood grasping the wire, watching it move away; then Tom with an explosion of energy swarmed up over the fence, dropped, and started to overtake it. Slowly and with difficulty I too climbed the fence, but I slipped as I was preparing for the drop, and I hit the ground hard with chest and cheek, and was knocked unconscious.

I don't know how long I lay there. When I pulled dizzily to my feet and looked about, there was no sign of Tom. Back in the field I saw the two other men working in the trench as before, so I knew they had not seen what had happened. I thought I'd better find Tom, and struck out in the direction he had been headed, crossing the side road there and edging through the barbed-wire fence of the field on the other side.

With mounting anxiety I ran across the field to the small wood on the far side. I hurried back and forth

among the trees, calling and searching, but there was no sign of him.

Beyond the wood I continued in the same direction, as far as I could judge it, climbing fences, crossing fields, passing the edge of the grounds of Pemberton General Hospital and bearing straight toward Big Pond, where Tom and I lived. I ran, when breath permitted, making wide detours to examine dim objects in the fields, and hurrying always. In this way I covered the whole two miles to the town, but found no trace of him.

At the town I made a real stop for the first time. As my breath came back my wits did, too. I realized I had witnessed an event fantastic beyond credibility. How could I tell anyone what I had seen? I'd not be believed. People would only think me crazy. I decided to keep mum until I'd found Tom.

I set in motion again, inquiring for Tom of people on the streets, but no one had seen him.

I went to his home then, full of a sudden foolish hope that I'd find Mary there, and perhaps Tom; but the house was dark and no one answered my knock. I entered and looked about. A tiny kitten came rubbing and squeaking against my ankles.

I phoned Wilson's. The watchman supposed Tom was still back in the field—and yes, the horse was still tied to a tree in front. He'd not seen Mary leave the field, either, nor me. When he started to ask questions I hung up.

I suppose I'd still been hoping that what I'd seen had somehow not happened; but the watchman killed that hope.

I was greatly worried about Tom and how his fantastic pursuit may have ended. I decided to stay right there until he returned. He'd certainly come home. After we'd compared notes, we'd report together what had happened. I cleaned the bruise on my cheekbone, then settled down to wait. I was very tired. A long time passed, and I fell asleep.

II

WHEN I AWOKE it was daylight, and the kitten, a tiny puff of fur, was sitting on my chest looking cryptically into my face. At once I phoned Wilson's. Tom had not reported back from the field and the other two men had gone home wondering. The horse was still there. I told them nothing.

I'd hardly hung up when the phone rang. It was the Pemberton General Hospital. They wanted to speak to Mrs. Sellers. When I said she wasn't there and told who I was they asked me to come to the hospital. Tom was there and wanted to speak to me.

I hurried home, backed out my car and drove over.

I found Tom in a small room, alone, strapped on a cot. His forehead was covered by a patch of white bandage, and over the patch lay his ever-unruly lock of red hair. At once, with a wild surge of hope and fear, he asked:

"Jack, you saw it?"

He was hoping the thing hadn't occurred.

"It happened," I said. "I've been waiting for you to come home. Why are you here?"

Before he could answer a nurse entered and asked who I was. She told me Tom was picked up near State Park; he was lying in the road, bruised and delirious.

"You've got him strapped down!" I said accusingly.

"He's been violent. He kept trying to get away. It was only a little while ago he told who he was and asked us to phone his wife. He also wanted to reach you."

Tom said, "Make them take off these straps, Jack."

"Take them off," I urged the nurse. "You can see he's all right now. He's had a bad shock, that's all. I know all about it. I was there."

The nurse left to consult the doctor in charge. Tom at once turned a tortured face to me.

"It was her—head?" he asked, still doubting his memory.

"Yes."

"She hasn't been home?" he asked, still hoping, or perhaps confused.

"No. And Pinto's still tied outside the Lab."

"Then it's so," he said. "It's really so."

"What became of the—her head?" I asked.

"Gone! Gone! Sunk! Jack, what happened?"

"I don't know. It's something new. Something that's never happened before."

Tom's expression was pitiful. He cried, "It was just her head! Where was her body?"

"I don't know. It disappeared. There was just that crack, and the smoke, and then—nothing else."

His eyes filled with tears.

"Where is she?" he cried in anguish.

I heard footsteps and barely had time to say, "Don't tell them anything!" when the nurse entered with a doctor.

That started an argument. Tom demanded his clothes so he could sign himself out; the doctor explained that his physical condition was uncertain and he should remain until the next day. It was finally agreed that he could leave that evening, if he seemed all right at that time. The doctor told the nurse she could remove the straps.

"I'll be back for you after supper," I promised Tom. "Try to get some sleep."

With haunted eyes Tom watched me leave. But he remembered Pinto, and called out to me to take her home and feed her.

I know nothing about horses, so I drove back to Big Pond, picked up a handyman I knew there, and drove him to Wilson's to do it for me.

Then, since I was right at the Lab and had an obligation to report, I decided to tell the whole story to Dr. William Chambers, the director and head. I took the flight of stairs to his offices and asked to see him. Mr. Merriam, the superintendent, took me in.

Dr. Chambers is a tall, lean, friendly man, talkative and always approachable, so I boldly told him what had happened. But he didn't believe me. He only sat there and looked at me. He didn't even say anything, and neither did Mr. Merriam. I pointed to corroborative details—Mary's not going home on Pinto, Tom's disappearance from the field and his presence in the hospital—and he only looked at me oddly. I became excited and raised my voice, and that didn't help any. Of course I had that raw bruise, I wasn't shaved, and my story certainly was wild. I left him rather abruptly, before he should tell me I was fired, or maybe try to have me held for observation.

I couldn't blame him.

BEFORE I LEFT the premises I went out into the field and made a hurried search for some sign of Mary's body, or some indication of what happened, but I found nothing. I drove home then, ate, undressed, bathed, shaved, and lay down; but I couldn't sleep.

After supper I drove back to the hospital. It was dark before Tom and I got away. In the hospital I'd seen him keep up some appearance of normality, but as soon as he was in the car he slumped back, the hurt man he was. I told him about my seeing Dr. Chambers, and how I'd searched the field. I was very curious

about what had become of the head, but I couldn't get him to talk. He sat sealed in bitterness, and appeared not even to hear what I said.

When we arrived at his home he just sat in the car and turned his head away.

"We're here," I announced. After a moment, haltingly, he said:

"You go in first and . . . and . . . see if she's there."

It was pathetic. I went in and looked through every room, the kitten following me, squeaking. Mary's things lay here and there about the house, especially in the bedroom, but Mary wasn't there, of course, and never would be again. I went out and told him. He sighed.

"I'm afraid to go in," he confessed. "Would you mind if I stayed at your place tonight?"

I said I'd be glad to have him; I didn't want to leave him alone in that silent house.

"There's a little kitten," he said; "it must be hungry. Will you go in and feed it? There'll be something in the refrigerator. I'll go tend to Pinto."

He got out of the car and went around back. I went in and fed the kitten. It was extremely hungry. When Tom came I drove over to my home.

My father was there, but we bypassed him and fixed some drinks in the kitchen. After we'd brought them to the living room we told him what had happened.

At first he too was incredulous. When he began to believe, he was so affected that for a moment he stuttered.

"What happened?" Tom asked him eagerly.

Dad's a mechanical engineer, but of course he didn't know.

"It was mostly the head!" Tom cried. "It didn't fall, it floated. It floated eastward in a straight line, right through the fence, right across the road and field and the trees on the other side and through everything it met. It went right across our old farm. It went lower at the pond, and passed a little above the surface. I got around the pond in time to find it on the other side. It went on and on. But when it came to the lake this side of State Park it just skimmed the surface, and I think it sank under, because I didn't see it any more. How can that be?"

Of course we had nothing to answer.

"It seems to me it was lighter, I mean thinner, a little transparent, toward the end. As if it were dissolving. And there was something more. I thought I began to see the outline of Mary's body with the head. Just a hint of it. But I'm not sure. It was way out over the water."

We sat for a moment, wondering about this.

"One thing is clear," I pointed out to my father: "The object didn't obey gravity. I guess I ought to say it *seemed* not to obey gravity, because nothing can be independent of it. The object didn't fall. So it may have something to do with other dimensions. Something special to do with space, time, matter, electricity, gravity. I don't know how to put it in words, properly. We know there are extra dimensions in mathematics, but they're just concepts, abstractions; useful in calculations, but without a corresponding reality. Of course there've been theories and stories which dealt with the material reality of other dimensional states. Could this be the clue?"

Dad thought it over. "It seems more likely than anything else—though to say that doesn't explain anything," he answered. "I don't know any more about such things than you. You'd have to talk to a theoretical physicist."

"Herzog!" I exclaimed. "He'd know, wouldn't he? All that publicity given to his Comprehensive Field

Theory. That includes gravity."

"His theory is only a theory," Dad said. "Furthermore, it's known to be imperfect. It has a flaw. It's a magnificent thing, a big step forward; it neatly reconciles previous inconsistencies; but physicists say there's one phenomenon that doesn't jibe with it. They call it the *Exception*. They say Herzog is working to account for the inconsistency—he and the other top theoretical physicists in the world."

"Do you think he might be able to explain what happened?" Tom asked.

"It's very doubtful," said my father. He got up and took a thin pamphlet from the bookcase. "Here's his Field Theory. Twenty-one pages, almost all of it symbols and equations. All condensed at the end into four short equations. And maybe contains an error. They're not even sure." He opened the pamphlet at random, shrugged, and handed it to Tom. Tom looked helplessly in it here and there.

"Thousands like that were sold, and almost all are mere souvenirs. In the entire world there's only a handful of men who can understand what he's done there. Only the specialists, the top scientific brains. To the public—you-me—the book's only a bit of curiosa, something to strike awe, proof that the world is wonderful and that genius exists."

There was a silence, while Tom thumbed through the few pages. "Then the secret lies in this," he said hopelessly.

"Perhaps."

"And hardly anybody can understand it."

"Hardly anybody."

"Space and time and matter and electricity and gravity . . . I'm an electrician and I use only a dozen symbols and equations. Here there's a bookful. And somewhere in them it explains where Mary is. Or what happened to her."

Tom sobbed and tossed the book to the other end of the sofa. After a moment he reached for it and leafed through it again. He said:

"Where does Herzog live?"

"Somewhere in the city."

"He could tell me . . . Do you think Dr. Chambers at Wilson's understands this?"

"Possibly," Dad answered. "He's a very big man."

"Don't look for any help from him," I warned Tom. "I told you how he didn't believe me this morning."

Conversation stalled. I saw tears in Tom's eyes. Suddenly he blurted:

"If Mary'd just died, that wouldn't have been so bad. Oh, it would be bad, but it wouldn't be like this! Is she dead? I mean dead like other people who die. Can you tell me that?"

"Of course she's dead," I said. "Even if her head and body exist somewhere, they may be separate. That could happen in an ordinary explosion: part of the body can disappear, the rest is found. If they're together—if you really did see her body at the end—they would have to be in a different condition, a different state of matter."

"Why didn't this ever happen to anybody before?"

"Perhaps the required conditions never existed before," Dad said. "There's never been a setup like the one at Wilson's. Think of it—artificial lightning—outdoors—the great scale. The high towers, the Van de Graaff generators, the tremendous capacitors, the big field laced with trenches containing carriers, some of new types under test—all this, unique. The carriers may have been transmitting currents at highly critical values—not necessarily large, but critical—and what happened may have been the result of a step function. At one set of values everything's as usual. Add one

ampere somewhere and there's a sharp change, a new phenomenon. Something like that."

This made sense to me, but it hardly helped Tom that evening. Again and again he exclaimed, "If she could only just have died! So she could have been buried. Like other people. Her complete body."

There was no way to comfort him. Eventually we went to bed. I put Tom in the spare room and stayed until he had undressed and lay down. In my own room, worn out, I quickly fell asleep.

III

I DIDN'T sleep long. I dreamed that I heard someone downstairs phoning, then, some time after that, I woke to a noise in the room. When I switched on the light, there stood Tom, fully dressed. He said:

"I've found out where Herzog lives. I'm going to go ask him."

"For heaven's sake go back to bed," I cried, coming awake.

"He's the only one who can explain what happened."

"I don't believe he can explain it," I retorted. "And if he could, he wouldn't. Do you think you can go barging in on him in the middle of the night? Go back to bed. We'll see what we can do tomorrow."

"I can't wait, Jack—I can't stand it!" he exclaimed. "I want you to come with me. If you won't, I'll go alone."

Impetuous, stubborn—that was Tom all over. I couldn't dissuade him. More than a little angry, I got up and dressed. I decided that my part in the excursion would be to try and keep him out of jail.

Tom pushed the car from the garage to the street,

so we wouldn't wake Dad, and gradually as I drove toward the city my anger left me. I tried to talk Tom into returning, but it was a waste of breath. We crossed the Triboro Bridge and passed across town. It was a little after two o'clock when we stopped in front of the address—a narrow four-story private house on the western edge of Washington Heights overlooking the Hudson.

The neighborhood was lonely and deserted. Few lights showed in the blocks of apartment buildings toward the east, none showed in Herzog's house. I felt like a criminal, to be invading the midnight privacy of the great man on Tom's irrational quest. I made one last attempt to dissuade him.

"We just can't do this, Tom! Whoever'd come to the door would be sore as hell. They wouldn't wake him; they'd just have us arrested!"

But stubbornly Tom said, "Herzog's up. He works all night, everybody knows that."

I temporized. "Then let's see first if there's a light in the back of the house. If there's no light we go back."

I got him to promise. We left the car and found a way to a rear court through a service passageway in the adjoining building. Above us, in the top floor of Herzog's house, were two lighted windows. I groaned. Without a word Tom led me back to the front of the house and pushed the door button.

We heard the buzz, and waited. There was no response. Tom rang again, longer, then rang several more times, but no one came.

"Well, that's that," I whispered with relief. "He's working and no one's going to answer."

Tom tried the knob and pushed. The door opened. He whispered, "We'll go to him," and entered, and after hesitating a moment I followed, stifling my protests.

Not a sound reached us in the narrow hallway; everyone seemed asleep. A night light at the second-floor landing lit faintly the carpeted stairs. On tiptoe we went up. Twice more dim landing lights showed the way, and we found ourselves on the top floor.

Ahead was a partly opened door, and sharply through it came light from the room we'd seen from the courtyard in back. Tom tiptoed to it, I following. We looked into a large room shelved with books. To the left were a writing desk and chair. At the far end, between the two rear windows, was a large flat table, and seated on the other side of it, reading, was the man we had come to see.

I stared at him. This was Herzog, greatest of theoretical physicists. This the famous head and face, different, pictured thousands of times in the newspapers of the world. As in the pictures, both head and face were covered by an even mat of cinnamon-colored bristles half an inch or so long. The eyebrows were other bristles to match. The all-over fur made his head seem even larger than it was, and it hid completely the expression of his face. Set in the middle was a pair of old-fashioned pmch-nose glasses.

I said Herzog was reading, but more exactly he was comparing. To his left, on the table, held open by his left hand in an upright position, rested a large book; directly in front stood another, held similarly by his right hand; and to his right, flat on the table, lay a third, a pamphlet. The glasses in the center of the spherical mat would point for a little at one book, then turn and point at another, then point perhaps at the third; he was reading back and forth among the books, changing irregularly. We stood almost in the doorway, but he seemed oblivious of us.

After a moment Tom stepped quietly inside, and I followed. Herzog didn't pause in what he was doing.



"Herzog."

I was hot with embarrassment; I'm sure Tom was too, but he hesitated to interrupt.

We stood there perhaps half a minute, though it seemed much longer; then, with the briefest of glances at us, Herzog said quietly, "Go away," and at once was back at his work.

We stood there like a couple of idiots, paralyzed. I was more than ever determined to let Tom be the criminal. Another moment passed.

"Go away," Herzog said a second time, again with the brief glance. He was so quickly back at his comparing that we were put further off balance. Yes, like idiots we stood there, but we were so surprised! There was this unique man, working at supremely high level through the night, while for miles around him, horizontal, the millions of the great city slept—and there were we, strangers, illegal enterers, who'd crept up through the silent house to this room—intruders of unknown intention, cranks or dangerous men, for all he knew—and he showed no alarm, not even concern, but had merely noted peripherally our two presences and twice lifted his eyes for a flash and said, "Go away." What kind of concentration, or poise, or fearlessness, was this?

At last Tom cleared his throat and spoke.

"Mr. Herzog."

For a moment the comparing continued, then the physicist looked up.

"Will you go away," he said, and this time there was irritation in his voice.

"Please, Mr. Herzog," said Tom, "—it's very important—we've come—I think you'll be interested—" He stopped, rattled, embarrassed by his bad start.

"Well?"

"Something happened. Out at Wilson's Laboratory on Long Island. To my wife. You're the only one who can explain it. She was standing in the middle of the field and she disappeared! All but her head and a faint outline of her body! It went floating away! I followed it for miles. It was last night. We think it might be something about the other dimensions. Yes, and gravity, because the head didn't fall; it floated. It floated along and I followed it. It went right through the fence! I know it sounds crazy, but it did really."

I came to Tom's aid. "I saw it too. It was just as he says. We both work there: I'm an engineer and he's an electrician. I told Doctor Chambers, head of the Lab, but he didn't believe me, so we've come to you as the only person who might explain it."

I stopped. For a moment there was silence while Herzog looked at us—me and my nasty bruise, Tom and his bandaged forehead. Then the mat of hair parted at his lips and he said, "Go away."

At this Tom stepped forward.

"It's really so!" he cried excitedly. "We're not crazy, and it wasn't an illusion; she disappeared, and her head floated away. She was my wife. Jack here saw it too!" He paused a moment, got a grip on himself, then retold the whole story, starting at the beginning and telling it rather well. Herzog listened without moving anything but his eyes; he didn't even lower the two books he was supporting. When he'd finished Tom held out something. It was the pamphlet—my father's copy of Herzog's Theory; I hadn't known he'd brought it.

"The explanation's in this," Tom said; "it's your book, your Comprehensive Field Theory. I can't understand it, hardly anybody can, but you can, because you wrote it. The head didn't fall—and your book includes gravity. You understand about such things. I've no one else to go to." He paused, while Herzog only looked at him. "Oh, don't you believe me?"

"I believe very little," Herzog said levelly. "I think in terms of probability. I find what you tell me extremely improbable. I might give it a probability of one in a million. If I could give it a probability of even one in ten, I would be interested. So would Doctor Chambers. Now I've heard your story. Unless you've something to add to it, I must ask you to go away."

I could see Tom desperately grasping for a way to continue the interview. He said:

"Then *make believe* we're telling the truth. If it were as we say, if it were, how would you explain it? I guess nothing can be done—you can't bring my wife back—but if I only knew what happened to her! Is she dead like other people? What about her head? And why did I maybe see her body at the end? If you could just help me to understand!"

At that Herzog let drop the two books he had been holding tilted. He pinched off his glasses.

"Understand?" he cried with apparent irritation. "What is that? How can we understand anything? People are born and die: do you understand that? I don't. Some men lie and cheat and kill, others lie and cheat very little, and don't kill at all: do you understand that? I don't. A mouse finds a piece of cheese and eats it: do you understand that? I don't. I hold out a book and let go, and it drops to the floor. You think I *understand* it? I don't understand it at all."

With the last words he picked up the two books, and immediately was back at work. In one second he had dismissed us with a finality as sudden and complete as an explosion.

Mumbling thanks and apologies we backed out of the room. I found myself in the car without memory of how I got there.

IV

AS WE PASSED back across town Tom sat hunched in the seat beside me, his head lowered, a stricken man. He muttered, "Even *he* doesn't understand. No one understands. No one in the world."

He brooded. As we crossed the Triboro Bridge he cried out suddenly, "It's not fair she should go just then!"

At that moment I didn't know what he meant. I went through the motions of trying to comfort him, and my words exposed a deeper hurt.

"She shouldn't have gone exactly then," he said. "It wasn't fair. It caught me. Things weren't right between us. And now it can never be fixed."

I kept asking him what he meant. Eventually he let go a little.

"Something happened between us there in the field. I got sore. She waved to me—and I didn't wave back! And then she was gone, and now I can never do anything about it, never."

In one of the recurrent flashes of light I saw there were tears on his cheeks.

"It couldn't have amounted to anything," I ventured. "She wasn't sore at you. I remember when she came she seemed wonderfully cheerful and happy."

"That was the cause of it!" he exclaimed. "I'd never seen her so affectionate near other people. She brought me a thermos of coffee, she didn't have to; I was through at twelve; but she just wanted to see me. Not for anything special, just wanted to see me. She didn't want to wait even three hours. She came on Pinto. She was a little afraid of Pinto, you know; but she couldn't wait three hours, and came riding Pinto, at night, bringing me coffee and just wanting to be with me a moment."

"I heard her voice. She came running ahead and I went to meet her. We kissed. I told her she needn't have come; but she said, 'I just *wanted* to come.' We sort of stood holding each other, but I was uncomfortable, because I felt the other fellows might be looking, and I didn't want them to see us so affectionate. I'm funny that way; I never could show any soft stuff in front of other people. And especially those guys; Jerry'd kid me for a month. Mary knew all that, but that night she just didn't care. When I wasn't expecting it she kissed me on the neck. I got sore. God forgive me, I got sore! I didn't want the other guys to see. I was ashamed. Think of it! Me, the luckiest guy in the world! But how could I know what was going to happen!

"I got sore, but it didn't seem to register. It was her mood; she was just overflowing with affection, she just couldn't help showing it; I think it was the baby, because I've seen her like that at home since she knew it was coming. So I got sore, and when she went away she turned and looked back, and I just stood there, and she waved, and I didn't wave back. Oh, Jack, that was a terrible thing to do! But everything would have been all right when I got home; I was crazy for her to be that way, only not in front of the other fellows. She waved, and I just stood there. She waved, and my God, I didn't wave back! And then it happened."

I said, "No one could know what was going to happen. It was just a tough break that it happened right then."

How flat my words were! I couldn't get to him. For some time he was silent; then he exclaimed suddenly in a low voice:

"If she'd only just have died! I mean, if she had to die, if she'd only got sick, so I could take care of her, and been good to her, and then if she'd died I could bury her, and know where she was. But this way—where is she? Is she dead like everybody else? Will I see her when I die? Or will she be somewhere else?"

I assured him he'd see her.

"But she's gone—disappeared, except—she went . . ."

"That makes no difference."

Again he was silent for a little, and in the recurrent lights I saw him sitting up, his eyes fixed gloomily on some point just in front. He said:

"I *had* to follow her. It seemed to me she was suffering; that is, at first. Her eyes opened—oh, that was awful! I thought I saw her lips move. I felt she was going to say something, or try to; but that was only for a moment. It floated on, and I couldn't understand the expression on her face. I kept trying to; I ran and looked and looked; I fell down and got up; I ran around it, looking at it as it turned; but I couldn't make it out. There were several times her eyes opened and closed! I was scared, too. And I was sick for a while. But she didn't say or do anything; she didn't seem really to try to; she didn't even seem to know I was following. How was it she—it could pass right through the fence and the trees? It seemed solid, except toward the end; but I may have been mistaken. Why did she go under the water?"

I could only tell him that no one could explain such things. I said, "It was something new, but that doesn't mean it was something outside Nature. It's just something outside our understanding. Remember what Herzog said: he didn't even understand why the mouse eats the cheese. Or why the book would fall. It doesn't explain anything to say that the book falls because of gravity and the mouse eats because it's hungry."

This sort of thing went on. I couldn't calm him. "But this was *new*. And it had to happen to Mary. And it had to happen at just the one moment it shouldn't have happened. It caught me. It left me guilty, and there's nothing I can do about it. I never can square it with her, I never can say I'm sorry; I can't, not for all the rest of my life. It's not fair."

Of course it wasn't fair—but what in life is?

Toward the end Tom grew silent and bitter.

He asked to be dropped at his house, so I pulled up there. I didn't want to leave him alone, but he insisted, and I said I would drop around later in the day. Dawn was filtering through the trees when I got home.

This was the day the New Thing was to strike again.

V

I WOKE AT ELEVEN and at once rang Tom, but there was no answer. After I had dressed and eaten I drove over. At sight of the house I was dumbfounded.

It looked as if a tornado had hit it. Every window was broken, and all around the outside lay a litter of broken furniture and clothing. Small knots of neighbors stood about talking and gaping. I got out of the car and asked what had happened.

Tom had gone crazy, they told me. The police had taken him away. At about half past six he'd started throwing things through the windows. He'd completely lost control of himself. He wrenched apart tables, threw out lamps and chairs and other stuff, smashed his TV-radio against the wall, ran upstairs and broke every window, threw out bedding and clothing and shoes and furniture, and completely wrecked the place, upstairs and down.

By the time the police arrived, he had finished. They found him standing in the doorway, carefully holding in his cupped hands the body of a dead kitten, and he was starting back to put it in the garbage can. His face and hands were bloody, they said; tears ran down and mixed with the blood, and he'd sometimes say things that couldn't be understood; but he seemed to be over the violence of the fit. They had taken him to the station house at Pemberton; and someone said he'd then been transferred to the psycho division of Pemberton General Hospital, where he was being held for observation. He had not resisted.

I went inside the house and looked around. The lower floor was a total wreck. Upstairs it was the same. The bedroom was empty except for the bed frame and a litter of fragments—wood, glass, clothing; the window was a vacant rectangle, and the mattress lay outside on the ground.

I was overwhelmed. The poor man! I looked for the phone, but the wires were ripped out.

At a neighbor's I called the hospital, but they'd tell me nothing more than that he'd been admitted.

I drove there, but they wouldn't let me see him. The psychiatrist in charge wanted to see me, however, and I was directed to him.

He said Tom was in a seclusion room, at present rational and sorry, but bitter and melancholy. He said Tom had kept asking for me, and the psychiatrist set out to pump me of everything I knew about Tom's background in general and the outbreak in particular. But he let out he'd been trying to locate Tom's wife, and from the way he said it I was sure Tom hadn't told what had happened to her, so I kept mum about it. The doctor seemed quite unhappy about the skimpiness of the information. Unfortunately he knew about Tom's being picked up the day before. He said Tom

was under observation. Refused to let me see him.

Though worried about Tom and his confinement, I went home. There I thought up a tactic for getting to see him, and after supper I drove back to the hospital and again saw the doctor. I told him Tom had always been sane, but that he'd had a shock, and that anybody in the world might have exploded under the circumstances; I said that Tom's wife had gone away and would never be available for questioning; and I said I had all the information, and could straighten the whole matter out, but he'd have to let me speak privately to Tom first, for I'd not do it without his permission. I made him agree. He himself led me back through the psycho building to where Tom was.

On the way I took in everything I saw. The corridors we passed through were guarded—apparently—by pairs of attendants in white. Most of the doors were open, showing rooms just like those of living apartments on the outside. There was one large room from which came the sound of music and voices. I slowed there, and saw over a hundred people, men and women, all in ordinary street clothes, the greater part of them dancing and apparently having a good time. It looked like any other informal dance anywhere, except that the men and women averaged somewhat older. As I caught up with the doctor I asked him what the affair was.

"Just the weekly dance," he told me. "For patients who've sufficiently improved. As far as possible, we give patients all the experiences of normal social contact that they'd have outside. The big difference is that we protect them from things likely to be disturbing."

"But isn't it dangerous to let them come together like that?" I asked.

"It's a very good thing for them."

"I mean, don't they act irrational in front of each other? What if they become violent? Won't they set each other off?"

"It happens, but it's not common and it does little harm. They all know why they're here, and they make allowances. They understand that their leaving depends on their behavior. Most of them like the dances. Of course the patients are graded. As they improve they're put with more advanced groups and are encouraged to take part in wider activities."

Everything was new and interesting to me. We took an elevator to the fourth floor. Here I saw there were no doors on the rooms. In the corridor was another pair of white-clad attendants. Just beyond them, at one of the doorless rooms, we came to a stop.

It was a seclusion room. The walls were not padded, as I'd expected, but were unbroken planes of two-toned brown plastic. There was no window in the room and there was only one object there, a large, low, bare, canvas-covered platform fastened permanently to the middle of the floor.

On one corner of this platform, sitting on his haunches, arms around knees, sat Tom. He had on nondescript pajamas. There was a different kind of bandage under the red lock on his forehead, and in places on the rest of his face and nearby hands were ugly patches of iodine stain. His face wore an expression of sullen brooding. Sitting there so, he looked like some new kind of dangerous ape-man. But he was not dangerous at all; he was only my old boyish friend Tom—impetuous, unlucky, mortally hurt, and now in a little trouble. At sight of me his face softened and he got down and came forward.

The psychiatrist showed he intended to hear what we would say, but I held him to our agreement and

he took a position just outside the door where he could watch us, while Tom and I withdrew to the farthest corner of the room and spoke in whispers.

"You know what I did?" Tom asked me shyly.

"Yes, you dope," I answered. "I think you really are crazy."

"Maybe I was," he said, his face twisting. "For a while. But I couldn't stand it, Jack. I was full up. Mary's things were all around. I remembered how we'd had it there—a thousand things, our plans, the baby coming, and now her gone, gone that way. That was what did it. I started smashing things. It gave me some relief. As soon as I'd finished I was all right again."

"Well, it's too bad. All your stuff is ruined. It isn't even junk."

"I don't care. I could never live there again."

"It looks as if you're going to live on that platform for a while," I told him.

He didn't like the thought of that. He told me he had become perfectly all right by the time the police arrived. He said they didn't even have to give him a sedative. He said he did try to escape, though, but couldn't manage on account of the attendants. He told me how they operated.

"It looks easy to get out—no door and the attendants out of sight; but it can't be done. I tried twice, but they caught me and threw me back. Not hurting me, though, and not even getting mad. They know jiu-jitsu, and they're tough babies. They explained things to me. They don't have doors so the patients won't have the feeling they're caged in and abandoned; also they want to keep an eye on what's going on. You're at perfect liberty to try to get away; you can try, but they catch you and throw you right back in. But not hurting you, no matter what you do to them. You can try fifty times, and each time you go back. They say all patients, no matter how screwy, learn pretty quickly that it's not profitable to go out the door."

"You didn't tell the doctor about Mary, did you?" I asked.

"No. I'm not *that* crazy. They'd have kept me here for keeps. Did you?"

"No, they'd have kept *me*. But now we've got to figure some way to get you out of here. The doctor's beginning to look impatient."

"What can we tell him?" Tom said gloomily. "He certainly wouldn't believe the truth."

I hadn't been able to think of anything before, and I couldn't now. For a moment we stood looking glumly at each other, fishing for an idea. Seeing us silent the doctor stepped inside the room.

"Well?"

"My friend won't let me tell you anything," I said. "Both of us can explain his trouble, and if you believed us you'd let him go; but you wouldn't believe us. We don't know what to do."

The doctor didn't like that. I went on:

"But the facts that concern you are simple. Something happened to my friend the night before last. I saw it myself. He had a fit of temper, and you've got him here. If I told you what we saw you'd put me in the next room."

The doctor smiled and pshawed and shook his head. I repeated: "What happened in no concern of yours! This man's normal. But he's impetuous. He had a fit of temper because something terrible happened to him, but now it's all over. It's perfectly safe to let him go."

While I spoke his manner changed. He looked me squarely in the eyes and asked:

"Where's his wife?"

This was awkward; I had a vision of Tom held in that place for weeks while the police searched for Mary—or her dead body. As I hesitated, seeking the best answer, the general quiet was broken and the doctor turned his head and listened. Somewhere in the distance a woman had begun shrieking—a blood-chilling sound—and at once others joined in. Quickly there was a thick confusion of shrieks and cries and yells and shouts. A terrific excitement was occurring somewhere; it sounded like panic.

For just a moment the doctor hesitated, then he said to one of the attendants, "You come with me," and the two of them hurried down the hall. Then there sounded the loud clangor of an alarm bell.

With that, someone nearby started a frantic yelling. The remaining attendant cried to me, "Take care of your friend!" and disappeared from sight. I jumped to the door and saw him wrestling with a male patient several doors down the corridor. At once I turned to Tom and said, "It's your chance! Come on!"

We ran down the corridor toward the elevators, ignoring the attendant's yell to stop. Next to the elevators was the fire escape, and down we hurried several steps at a time, the noise of the distant panic growing louder. On the ground floor I opened the heavy door and peeked out.

The corridor was a place of wildest confusion. Scores of patients were milling about in every excess of behavior—laughing, crying, babbling, shouting, gesturing, screaming. It was mass madness in a madhouse. I couldn't begin to describe it.

We ventured out among them. Here and there a pair of attendants were subduing individual patients, and were having their hands full. I threaded through the horror as rapidly as possible, leading Tom past the room where I'd seen the dancing. I saw, then, that it was the dancers who were panicking. There were still scores of patients in the room. Two of them were jerking on the floor in fits. Others were rushing wildly back and forth, pop-eyed, shrieking, pointing at the ceiling, thrashing their arms and yelling nonsense. But all this I took in at a glance, for we were working our way down the corridor.

Until then all the patients I'd seen were dressed in street clothes; now I began to see some in pajamas. They seemed to come from an intersecting corridor. As we pushed through them, one attendant, momentarily free, made a jump for Tom. I straight-armed him, and as he staggered back we escaped into a wild group of patients just ahead.

During this time I gave little attention to the yells of the patients because it was all so crazy, and for this reason I had no idea what had set them off. We were fully occupied in shoving a way through.

We reached the point where the corridor opened into the reception offices. A glance showed that the entrance doors were guarded. I turned back in the corridor and entered an outside room. Tom seemed to read my mind, for as I hurried to one window he ran to the other. Seconds later we were outside on the grass.

"Follow me," I said. "I've got the car."

We ran across the lawn to the gate, Tom in his pajamas at my heels, and a few minutes later I had Tom at my home. Dad wasn't in. I turned on the radio first thing, for I knew there'd be a bulletin warning the Island of the escape. I had just assembled a pair of drinks when it came. The announcer said in effect:

"A panic is under way in the psychiatric building of Pemberton General Hospital. The patients are still out of control. An undetermined number have es-

caped, and relatives and residents of Long Island are warned to be on the watch for them. They may be dressed either in ordinary street clothes or in pajamas. If you see anyone acting strangely, detain them if possible and call the nearest police station. Be tactful and watchful, humor them, and don't be panicked. They may be excited, but for the most part they won't be dangerous." He gave a list of local police stations and their phone numbers.

There was no news in that for us. We talked. Tom's spirits were sinking, and I tried to cheer him up.

Twenty minutes later, on our second drink, there came a second bulletin, shocking. Interrupting a program of dance music, the announcer said:

"It was a mass hallucination that caused the panic among the mental patients of Pemberton General Hospital, according to information reaching our newsroom. It occurred among a group of a hundred advanced patients who were assembled at a dance. Patients say that suddenly, as they danced, two heads appeared in the air at one end of the room. They were human heads, with faint outlines of their bodies, and they floated across the room a little below the ceiling. Both were men's heads, they say, and one of them had a small moustache. *The objects floated to the opposite wall and passed through it.* The panic followed at once. Dr. R. A. Connolly, head of the Psychiatric Division, states that the panic was due to contagious hysteria. Dr. Connolly is now at the scene and the patients are rapidly being brought under control. It is now thought that only a few escaped. Hospital officials are sure that the incident is over. Patients and attendants are being questioned in an effort to discover how the mass hallucination started . . ."

VI

TOM AND I looked at each other, aghast. Again the New Thing had struck. A second wonder had occurred, and two more human beings had been caught and killed. In a whisper, Tom said:

"It was my crew. Jerry had a small moustache. It was Jerry and old man Williams. It's the same time of night, and it was the same as Mary. It must have been the same spot of the field."

"And the heads took the same direction," I added. "This time through the psycho building of the hospital, last time passing the edge of the grounds."

"So I have murdered two more people," Tom murmured.

"Why do you say that?"

"I should have warned the other fellows. I should have told them about Mary."

"They wouldn't have believed you."

"Maybe not, but they might have avoided that spot. At least I could have tried. But I didn't even think about them. All I could think about was Mary. And now they're gone too."

He went on, morbidly accusing himself. I said:

"But Tom, you were in the hospital all day. I warned the Lab; I did it for both of us; but Doctor Chambers wouldn't believe me. And you can't blame him. Why, we didn't dare even to tell them at the hospital. It just couldn't be helped. It was something new that happened, and we couldn't be expected to suppose it would repeat."

"Now snap out of it. We've got to do some talking to somebody, and it's not quite simple. You're a fugitive from the nuthouse, and I'm guilty of helping you escape. You haven't even any clothes—look at you, in pajamas; all you've got left in the world are at the reception room, in the hands of the attendants at

the hospital, and eventually the booby men will be here looking for you. We've got to get away from the house, but first you've got to have some clothes. Mine'll fit you loose—mighty loose—but it can't be helped. Come on upstairs."

I got him into one of my old suits, one I wore when I was thinner, but it wasn't too good. I was a little worried about his behavior. He tended to talk morbidly. He moved as if in a dream. When I tried to rouse him—kidding, for instance, about the fit of the suit—he didn't even seem to hear what I said.

My idea was to go off somewhere in the car and make a plan; but as we were leaving the phone rang. Something made me answer it, and I was glad I did. It was Doctor Chambers, head of Wilson's. He asked:

"Have you heard what's happened at Pemberton General?"

"Yes, sir," I said.

"The watchman caught the radio bulletin and told Merriam, and he checked by phone, and it's true; there *was* a panic, and it was over two floating heads and their indistinct bodies—two more! What's going on? Of course it was only a mass hallucination, but Merriam says that two of our men working in the field have disappeared—and why should the patients have the same hallucination as you? I'm going to the Lab at once. I want you to meet me there. Find Tom Sellers and bring him. Where is he?"

"Right here with me," I answered, and briefly I told him about the commitment and escape.

"Has his wife turned up?" he asked.

"No, and you've been told why."

"My God! Well, bring him. Leave as soon as you can. And keep your mouths shut. Has either of you told anyone besides me?"

"Only my father. But I warned him not to say anything."

"Don't tell anybody! We don't want to look like fools. Of course there's some reasonable explanation. Say—the watchman said one of the heads had a small moustache, and Merriam tells me one of our two men had a small moustache. Ask Sellers if that's so."

"He's already told me it's so. And I know the man myself. It's Jerry."

"What's really happening? Well, I'll be right down. You leave at once."

He hung up. I explained the conversation to Tom and started out the door, but he was slow to move and there was a sly look on his face.

"What's the matter?" I asked.

"Maybe Doctor Chambers can get Mary back," he said.

"Oh stop it, Tom! This isn't normal behavior!"

"It wasn't anything normal what happened," he came back. "What if our seeing her was only a hallucination? If she isn't dead there may be a way to get her back. I've read about things like that. *She could just be in some other dimension.*"

My irritation became pity. "Tom, she's gone. Why do you go on torturing yourself? Don't. It's all over. Get used to it."

I got him in the car. He maintained silence, and I knew my words hadn't made any impression.

Merriam met us at the Lab, and we'd hardly climbed to the second floor when we heard Doctor Chambers' car arrive. In a moment he joined us.

"No sign of the two men?" he asked Merriam.

"None."

Doctor Chambers shook his head. He said, "If their wives phone, stall them off."

"Yes, sir."

The Chief led us into his office and asked us to be

seated. From his desk he turned to Tom and said:

"Tell us what happened that night, Tom. I want to know every single thing in order, just as it occurred."

Tom told his story. At certain points both men questioned him closely. I told what happened from my point of view. When we finally were squeezed dry of information we all sat silent for a moment; then Doctor Chambers shook his head.

"No, no," he said, "it can't be. It just can't. Extra dimensions exist only on paper; they're nothing but abstractions, useful in mathematics. It's never happened, it never will happen, it can't happen."

"I've the feeling Mary's alive somewhere," Tom said.

"She's not in any other dimension, if that's what you mean. That would be magic."

Still hopeful, Tom suggested, "I know it's something that's never happened before—but there's never been a setup like the one in the field."

"Are you out of your mind? Two different things happened, one to the head and one to the body. Even assuming for a moment that you did see them together at the end, and that they still exist somewhere, do you imagine there was no damage done? . . . Forgive me, Tom, that was crude. But you're being morbid. You have to learn to face the facts." He reached for a rolled-up blueprint at one side. "Is this the print of the field installation?"

"Yes, sir," said Merriam.

He was already unrolling it. He studied it a moment, then he had Tom and me indicate the exact places everybody had stood the first night. I pointed out that the spot fatal to Mary was on a footpath leading to the exit in the main building—the path which would be used also by the missing men. He didn't comment, but after a moment picked up several small white rolls.

"These the tapes?"

"Yes, sir."

He unrolled and studied them for a little. Then he questioned Tom and me closely, to ascertain as nearly as possible the exact time of the first blow. Our best estimate was 9:20 p.m.

"That's also the time the panic started," Merriam pointed out.

The Chief's mouth tightened. For some time he studied the tapes. At last he raised his eyes. He said:

"These tapes contain time-change graphs of all currents and voltages in the carriers of our outdoor circuit. Tests were being run both evenings, but the values were extremely small."

He hesitated, then added, "But perhaps they were critical."

Again he hesitated, then repeated one word, "Per-haps."

A moment later, as if making a reluctant admission, he added, "At 9:20 on both evenings the values were identical."

This was significant! We all sat digesting this, and he went on, "It was surely nothing dimensional: that's most improbable. But something certainly happened. It was of fantastic nature. It happened twice. Each time it appears to have happened under identical conditions of time and place."

He stopped and sat thinking. I ventured:

"We were wondering if it can be explained by the Comprehensive Field Theory."

"Herzog could answer that better than I."

Tom and I told him about our interview with Herzog, and he listened carefully. When we'd finished he said:

"It's clear Herzog didn't believe you. He didn't



"... all currents at the critical values."

face the problem. His lecture on understanding, while true enough, was mere generalities. But the situation's different now. There's been a repetition under identical conditions." He sat thinking. "I think I'll call on Herzog. I confess, at this moment it does look like magic. At any rate it's not something for me to try to handle alone . . .

"I foresee, to investigate this may be a terrific problem, requiring a great deal of work. We shall have to move fast, for Merriam says both men of last night's crew are married, and at anytime we're going to begin having inquiries from their wives. After a little of that the reporters will be on us . . . Merriam, please see if you can reach Herzog on the phone."

This proved impossible; the number was unlisted. At once Doctor Chambers ordered Tom and me to go for him, and we waited while he wrote a note.

We drove back to the city, then, Tom more than ever buoyed with irrational hope. This time Herzog's door was locked, and we had to make a disturbance before someone—a housekeeper, I think—came to the door. She wouldn't let us in, but took the note to Herzog. He came down and listened, through a narrow opening of the door, to our story of the new developments. He seemed skeptical, but went back in and phoned Doctor Chambers; then he followed us to the Lab in a taxi, obviously unwilling to trust himself with us in our car. Not unnaturally. Tom certainly looked wild with his bandage and iodine stains and baggy suit.

Tom said little on the way back, but I, who knew him so well, could tell he was throbbing with hope. For Herzog was committed, now! Herzog himself was on his way to meet the problem! Herzog would find

out where Mary was, and perhaps somehow pull her back! It was pathetic.

VII

WHILE WE WERE gone Doctor Chambers had begun assembling the special troops needed in the coming assault upon the Unknown. He glued himself to the phone, summoning certain of the older members of his staff and several of the lesser employees, then putting through long-line calls to a number of outstanding scientists of the East—shocking them to full wakefulness, extracting promises of secrecy, and persuading them to come to the Laboratory at once.

Upon our arrival he at once took Herzog into his office and remained closeted with him. Tom and I, floating around, found some of the Lab employees already there, each with an assignment. A young staff engineer had been stationed at the switchboard with strictest orders to complete no outgoing calls; manual workers had been set to guard all entrances to the field and main building and the stairs to the upper floors; and there was activity in the machine shop. Curiosity was high, but we pretended the same ignorance as the others.

Soon the first of the summoned scientists arrived—Dr. Mangin, famous biophysicist—and immediately was taken into the Chief's office. On his heels came Professor Downing, chemist and Nobelist; then Doctor Polakoff, nuclear physicist. At irregular intervals others arrived and went in, several with equipment they brought with them. Some time before dawn Tom and I were summoned through the switchboard.

Eleven men were sitting about the Chief's desk,

some of them world-famous, several of them members of his staff, all of them masters in their fields. They were of many ages, but their manner was uniformly grave. They looked at us in dead silence as we entered. Merriam placed chairs for us at one side of the Chief's desk.

Doctor Chambers introduced us, saying it was we who had been the witnesses. He tactfully asked Tom if continual reminders of his tragedy would be too painful, and was told they would not. He indicated to us the seated group.

"These gentlemen whose faces you don't know are scientists, come at my urgent summons. They've been told all the facts, and together they have the special knowledge and abilities which make them competent to investigate our problem. The problem is a new one, startling. It appears to be one involving what laymen call the dimensions. It promises to be extremely difficult, and it will require all our combined resources to deal with it. We may fail. But we're going to try.

"We've discussed a number of aspects of the situation and have decided on the preliminary moves. We attack at dawn. 'Attack' is the word, for the phenomenon which has struck twice is like a murdering enemy. The attack will be made by the scientists you see here, together with several others yet to arrive. We are all 'generals.' It will be an action of generals. Except for you two, only we generals will know what we are about, and even you, I'm sure, won't fully understand what we do. It's of utmost importance that no one outside this room learn what happened or suspect what we shall be doing; the newspapers would have reporters swarming over the place, distracting us and interfering with our work.

"We're in a most vulnerable position. The men outside are curious. Their wives will be gossiping. The wives of the two men who disappeared last night will be phoning at any time. There must be no leak until after 9:20 tonight, at least—for at that time we'll make a major experiment. No leak! No remarks before the other men, and all conferences and conversations here, behind closed doors!

"You two men are in a special position, so we will employ you as is indicated. We have work for you all day. This is the situation and our intentions:

"On Tuesday evening at about 9:20 you witnessed the first phenomenon. The sensory data were of several kinds: a crack, a cloud, the disappearance of the body of the woman, and the floating away of her head. We know the exact spot where the event occurred. Two evenings later, on Thursday, again about 9:20, a repetition of the phenomenon must have occurred. This time many witnesses a mile away saw the floating heads, but nothing more. The question arises: Did both the woman and the men disappear from the same spot? For theoretical reasons it's probable they did; but we need data. Our first object, then, will be to ascertain the number and locations of all active spots in the field, if more than one. Our next object will be to test the daylight behavior of the active spots. We must do this in time for tonight's major experiment.

"The surface of the entire field must be examined. But—the two phenomena involved the space above the surface. Furthermore, at the necks of the three victims there occurred a *difference* in phenomena: below them one thing happened, above them another. So we must examine also the space *above* the surface. There's no telling how high the activity extends, but today, in our limited time, we shall probe up to ten feet.

"All right, then, the surface of the field must be

examined, and the space just above it must be probed—and you two, being young and vigorous, will be of help to us there. I've had a dower made. That's as good a name as any." He smiled slightly. "It's ready now, in the machine shop. You two men will carry it, if you're willing. It's in two connected parts; each of you will carry one part. The largest element of each part is a 20-foot pole. Fastened to the forward end of the pole, at a right angle to it, is a ten-foot crosspiece. Attached to the crosspiece at intervals are heavy cords which run to similar positions on the crosspiece of the pole carried by the other man. The poles will be carried horizontally, the crosspieces sticking up vertically, ahead. Each of the two parts will be supported by a shoulder harness attached at the position of balance.

"The cords are thirty feet long. They allow the probing of a slice of field thirty feet wide and ten feet high. Since the field is cut into irregular sections by the trenches, you will probe the sections one at a time, going systematically up and down and holding the crosspiece ends straight ahead, the cords taut. You will proceed slowly, eyes on the cords. If anything abnormal happens to any part of the cords, it will indicate an active place—but the place will be well in front of you. The part of the pole behind will serve as a counterbalance, to make the carrying easier.

"But you'll be accompanied. Alongside and behind you will follow all but two of the men in this room, and perhaps others who will be arriving. Some of us will watch the ropes, others will carry instruments sensitive to radiation and certain field effects, others will examine the surface of the ground for signs of an abnormal condition; these tasks already have been apportioned. The younger of us will take brief turns at the dower, to spell you. Mr. Hofkin will be stationed at the switches. Mr. Merriam will continue in full charge of this building, our base.

"Ideally we should cover the field twice, the first time examining and probing with no current in the carriers, the second time probing with the currents at the critical values shown on the tapes. But we haven't time. We'll probe once, with the critical currents on. That may discover any areas where there's activity. Very probably there's only the one . . . Well, these are the first steps. Is what I've said clear?" he asked, looking at us with a faint smile.

We told him it was. He asked Tom:

"It won't upset you too much, helping us in this way?"

"Oh, no, sir." Tom was eager.

"Are either of you afraid?"

We told him we weren't. He glanced out the window.

"We've had to wait for daylight, but now it's light enough to begin. You two get the dower and wait for us in the field. All right, we're ready gentlemen. Let's go check our instruments."

All rose, and a buzz of conversation started. At once he warned them, "Watch every word you say!"

Tom and I got the dowers and passed without challenge through the guarded door to the field; we found out later that we'd been given the run of the place, like the scientists. We adjusted the harnesses, then looked out across the early morning field. The sun had just touched the horizon; it was cool and lovely, the beginning of a beautiful spring day; but ahead, among the upthrust towers, lay the Unknown, and my heart beat rapidly. Tom's face was a mirror of hope.

The scientists soon joined us with their instruments. Doctor Chambers said, "The field is alive, now; all currents at the critical values. We'll do this section



"They were pink, fluted stubs."

first, then take the others around the outside in turn, working toward the center."

At his words I settled the band at my shoulder, separated from Tom to the full width of the cords, and then all of us, as one team, began to probe a slice of the section along the nearest trench.

We proceeded just as Doctor Chambers had explained. It was real work. The dowsing halves were heavy to begin with, and quickly grew much heavier. Before long we all took a short rest, and later Tom and I were glad to be relieved briefly by pairs of the younger scientists. Some of them, too, needed the stops for rest, for several of the instruments were bulky and heavy.

IN THE FOLLOWING hours we probed the whole field, except the central section. There was little talking, each man keeping intent on his assigned task—either examining the field or watching his instrument or the cords ahead. Two new faces joined us. Twice Mr. Merriam himself brought us sandwiches and coffee. We found no area of activity, and nothing untoward happened.

It was with apprehension and extra care that we tackled the triangular central section. This time, at the Chief's direction, we probed first along the boundaries of the three trenches. We found nothing.

We were not far from the known fatal spot, making a second pass inside the first one, when someone cried, "Stop! The cords!"

Everybody froze and looked. Tom and I held the dowsing cords as taut as we could, but on Tom's side they would not hold still. There was a slight motion

in them, a wave or vibration. At Doctor Chambers' order we took a small step forward. The motion seemed to increase. He called out:

"Anything show on your instruments?"

"No," was the answer. "Nothing." "No change."

"No charge at all? No radiation? No magnetism?"

"No. No. None."

Like field dogs we pointed the center of disturbance on the cords.

"One more small step," ordered the Chief.

We obeyed, and the motion this time increased definitely. I watched fascinated.

"Any indications?"

Again the answers came back: No, no change, none, nothing.

Doctor Chambers dropped a square of white cloth at Tom's feet, then he ordered, "Back up and we'll have a look at the cords."

They examined the cords and found no sign of damage or change.

"All right, move left," Doctor Chambers said. "We'll approach from the adjoining segment. Careful!"

He didn't have to warn us. We backed, moved sideways, and again felt toward the fatal spot. Again came the unnatural movement in the cords, and once more he dropped a white cloth marker at Tom's feet.

"Nothing on your instruments?" he asked.

There was nothing.

He ordered us back for another approach on the next segment, and dropped a marker as before. In that way, moving with great caution, a rough circle of about 40 feet in diameter was marked out. In the center of the circle was the known fatal spot.

At that point the Chief had us back away and probe over the top of every trench in the field, but we found nothing. In all the field, then, there was evidence of abnormal activity only at one place. We returned and stood looking at the circle, resting, wondering, the scientists making comments of a technical nature which in part I didn't understand. They seemed struck chiefly by the fact that none of their instruments had reacted to the strange activity.

Doctor Chambers broke our inaction. "Now we'll examine the ground there," he said, and he sent me back to Mr. Hofkin at the switch panel with an order to cut all currents. I hurried, telling Hofkin briefly what we had found. Upon returning I found the scientists in a ring at the border of the marked area, their instruments laid aside. Slowly they closed in toward the center, scrutinizing carefully the ground in front of them as they advanced. Several times one of them went down on his knees to look more closely at something, while the rest stopped where they were. Gradually they neared the fatal spot at the center. I was in back of the ring, but I could see that the central area seemed different from the rest of the field. It was bare there; the weeds, elsewhere knee-high, were missing, so that there was no evidence that the footpath passed through it.

The men were nearly elbow to elbow, when one, then another next to him, went down on hands and knees and brought their heads close to something they saw on the ground. Those opposite finished scanning the remaining small area between, then gathered about the two who were kneeling. I heard exclamations of excitement. I saw one of the kneeling men pick up something, then get to his feet, holding what he'd found on the palm of one hand, while all crowded about to look. There was a confusion of talk. Several times I heard the word "Flesh." After a moment I saw the Chief look about on the ground again, and himself pick up something. He turned it over—and the

excitement redoubled. All started looking about then, but nothing more was picked up. They gathered close about their finds again, and examined them and talked and exclaimed. I was dying with curiosity when the Chief turned and called to Tom and me. He pointed to three objects on the palm of the other man's hand and asked:

"What are those things?"

We put our eyes close to them. They looked like animal tissue. They were pink, fluted stubs, tubular in shape, about a quarter of an inch in diameter and nearly an inch in length. There were three of them.

"What would they be doing in the field?" he added, as I still examined them.

"I haven't any idea," I answered. "They look like parts of some animal. Parts that stick out. You can see where they were torn away."

He showed me what he held in his own hand. It was a man's rubber heel, much worn.

"We found this too," he said. "Ever see it in passing by here?"

"No, sir," both Tom and I answered.

He turned it over. On the other side, the *shoe* side, where it had been attached, was stuck a fourth bit of tissue. I was wordless.

"I wonder, could this heel have been on the shoe of one of the missing men," the Chief said. "Where were they working?"

With excitement Tom and I led everybody to the trench where the two men had been working the first night. Helped by us the Chief let himself down in the trench and tried fitting the rubber heel in some of the many footprints in the dirt at the bottom; then he straightened and looked up at us.

"It fits," he said. "It was on the shoe of one of the two missing men. There's no imprint of a shoe with a missing rubber heel, so we may suppose it was torn off while the men were in the active area."

We helped him out of the trench. What excitement there was then! Those scientists were dignified, sober men, and until then they'd spoken surprisingly little, keen as their interest obviously was—but now they gabbled like children.

"It might be significant that one of the nubs of flesh is stuck to the heel," one ventured.

"Those nubs aren't from any living animal," another kept saying. "I'm no specialist, but I'm quite sure . . ."—and he spouted technical terms in support of his opinion.

They examined the stubs again with great care. They came to agree that they were animal tissue; that they were fairly fresh, as if they had recently been on the living animal; that they had been violently torn away; that they'd never heard of an animal with exterior stubs like that. Most of them supposed that the one stub had become stuck to the top of the heel by the heel's falling on it, until Doctor Herzog quietly pointed to the possibility of a spacetime transfer of the stub from some space or time unknown; then for a moment they were silent.

Doctor Chambers said, "We need a zoölogist and a biologist, and maybe a botanist. I'll send for them."

"Better get a paleontologist, too," said Doctor Herzog.

"Yes," said the other, as if reluctantly. "Well, there should be some lunch waiting for us: let's go back and eat; it's getting on. I'll join you in a few minutes. These young men will handle the poles, and I'll explain it to them here."

He turned to us, and while the others started back over the field to the main building, he said:

"Our next job will be to find out the behavior of

this area under various sets of parameters involving current combinations, time of day, and so on. We'll be concerned with the entire volume of space above it to the height of ten feet. It's already noon and there's much to do, so we have to work fast.

"The activity seems to be a time-space-matter-gravity effect which probably won't persist. There's no time to set up proper experiments, no time even to devise them, so we have to use the means close at hand. It's been decided to stud this area with wooden poles, and observe on them the effect of the activity. The poles will project ten feet and will be laced horizontally with cord; I'll show you how we want the cord when you're ready. Mr. Merriam has ordered enough poles and cord for a thirty-foot square, and they should be here soon. He's also ordered a post-hole drill rig. When they come I want you to take charge of drilling the holes and inserting the poles. All currents will be off, of course, and the switches will be watched. The poles will be twelve feet long; set them two feet in the ground; pack each one in tightly. Start in the center and set them in rows fifteen inches apart. If you haven't enough to reach to the borders, no matter—fill the center. The job must be finished as quickly as possible. Use any of the men who are unassigned. And be sure not to tell them anything."

The orders were clear. We walked back to the main building together, where we found that the drill rig had been delivered. Tom and I quickly ate something at the trestles set up for the scientists in one of the labs (the other employees ate separately); then we started drilling, and when the poles came I took out every available man and we set them in. There were almost enough to fill the marked area. By late afternoon we had the poles interlaced with cords and the job was done. From the main building the area bristled like a huge porcupine.

Tom had been concerned all morning about Pinto, and at that point he got permission to go home to feed and water her.

VIII

WITHOUT DELAY began, then, the series of experiments which had been planned before dawn that morning. The scientists—all but Doctor Herzog and two other physicists—took position for their observations at the windows of a big laboratory on the top floor rear of the main building, overlooking the field. Many pairs of field glasses had been obtained for this purpose. Doctor Chambers flatly refused to let anyone observe from either the field or the towers, pointing out that with a phenomenon whose nature included factors of space and time it must not be assumed that parts of the field harmless in the morning were necessarily harmless in the afternoon.

I hung around in back, out of their way. Hofkin as before was stationed at the switch panel in the basement, and continuous contact was maintained with him by phone.

The first test was the most direct and important one. Step by step Hofkin was to bring the currents in the carriers to exactly the values of the critical moments of 9:20 p.m., reproducing the electrical parameters which had brought about, or accompanied, the fatalities.

By phone Hofkin read off to Doctor Chambers the steps of the current changes. The Chief repeated each figure aloud, elbows propped on the sill of an opened window, in his left hand the receiver, in his right the glass held to his eyes. I too watched through a pair of glasses.

I sensed from the Chief's manner when the critical values approached, but my glass showed no change. The poles remained upright and motionless.

Then, "Critical values!" repeated the Chief.

I, like all the others, watched intently through my glass. I saw a change. No crack, no puff of cloud, but motion. The tops of the poles at the center began to vibrate rapidly through a distance of perhaps a foot. From the center outward the vibrations gradually changed in direction and diminished in amplitude, and I could detect no motion at all in the outermost poles.

For a moment we watched the mysterious motion; then came the order:

"Cut all currents."

The poles became motionless.

"Restore all currents."

The vibration resumed. The hitherto silent observers now began to make exclamatory remarks, chiefly over the peculiarity of the changing directions of vibration from the center toward the outside.

"Cut all currents, Hofkin," the Chief said then.

"We're going out to have a look." The poles came to rest. "Good. Stand by, of course. We don't want anyone touching the switches."

Tired as all the scientists were by then, every one went out on the field to examine the effects of the activity on the poles and cords. I thought I'd better stay behind, and watched through my glass. They soon were back. The Chief went to the phone.

"Nothing showed, Hofkin," he said. "No damage, not a sign of change. It must be a step function."

"Now we'll continue with the tests as planned. You have a list of the parameter combinations we want to try. I'm going to report to Doctor Herzog and the other physicists; we've got to discuss what we observed. I'm turning the phone over to Professor Downing. He'll have my copy of the list, and will keep a record of the effects of the changes, if any."

He spoke to Professor Downing and left. I wished I could have gone with him to his conference! Professor Downing had just set himself for the new series of experiments when I saw Tom motion me from the doorway. I stepped out. He told me the handyman had been seeing to Pinto, so he'd come right back to the Lab on her. Tom was cheered by my account of the experiment. He tiptoed to the back of the room with me and we took turns watching through my glass.

The new tests were under way. Professor Downing kept referring to a paper in front of him—a list of the current combinations to be tried. The procedure might be explained like this: Assume there were five lines carrying current. Holding four of the currents constant, the fifth would be varied in steps below and above its critical value and the results on the poles, if any, noted through the glasses. This process would be repeated with each of the other four carriers. After the five series of such tests, the variations would be made in pairs of carriers, then threes, and so on. It was a standard investigative procedure; monotonous, perhaps, to the layman; but then the layman still knows so little about the methods of research.

We stood and watched nearly an hour, but in not one test did the vibrations of the poles recur. The values which brought activity were indeed critical!

Then we began to hear somewhere an irascible quacking, a sound ultra-familiar to Tom and me: ducks. A few minutes later Dr. Chambers entered the room. He talked briefly with the observers, noted with much interest the negative results of the tests, then called Tom and me over to a back corner. Quietly, so as not to disturb the experiments in progress, he asked

Tom in a tone of speculative contemplation.

"Is that your horse out front?"

"Yes, sir."

He thought a moment, then said:

"Some ducks have come. Mr. Merriam ordered them this morning; they're the one kind of animal at hand for use as guinea pigs. We'd thought to use them in experiments, both this afternoon and tonight: we'd planned to put them at the active spot, some low, some higher, then turn on the current and observe. Now they're here, but they're making a devil of a racket, and everyone downstairs is burning with curiosity about them, and I hardly dare use them, for it might tip off to others the kind of experimenting we're doing, and rumors would get out and the reporters would be on us. It can't be done secretly, unless you can tell us how to remove their quack. Anyway, there's hardly enough time. Our first experiment with flesh and blood will have to be the main one, tonight."

"We can use them tonight, but it's just been suggested that it might be better to use a single animal, a horse. We could tie it in place. Its head will come to about the height of a man's head. If the phenomenon repeats, the body should disappear and the head float off, showing in one animal the plane separating the two types of effect. It's a good idea. But horses are scarce, and we've not got much time. Do you know where we might be able to get one, quick? Any old horse, as long as it can stand up. We ought to have it here in an hour."

For an instant Tom hesitated, then he said:

"You can have my horse."

"Now, Tom, I didn't come to try and get your horse!" the Chief said instantly. "I don't want your horse: I only want to know, can you tell us where we can get one, right away?"

"There isn't any place you can get one quick. But that's got nothing to do with it. I want you to use Pinto."

The Chief paused a moment.

"I understand that you've had your horse since you were a boy, and are very fond of it."

"That's so, but she's old; her life is over. I don't want her any more. She'd only remind me of my wife."

"It's very doubtful if there'd be any pain."

"Even if there was, I guess what happened to my wife can happen to a horse."

Doctor Chambers paused again. He was being extremely tactful.

"It seems unfair, Tom. You've lost so much."

"I tell you I don't want her any more."

"We'll reimburse you, of course."

"No. No money. I'm glad she'll be able to help you. I'm grateful for all you people are doing. I know it's not for me, but I'm in the middle of it, and maybe Pinto'll help you find where my wife is."

A pained look came to Doctor Chambers' face. He said firmly:

"Tom, you mustn't think you're ever going to see your wife again."

"Well, I can't help hoping. I've read things with theories about the dimensions. It could be like a hole opened in the universe, and people disappear into the hole. If the thing could be reversed, maybe she could be pulled back. So I at least could see she's really dead."

The Chief shook his head. Gently but still firmly he said:

"You'll never see your wife again. Not even dead. Get that into your head, Tom. All of us here have been completely upset by what's happened. We don't understand it. Perhaps the human mind can't under-

stand it. We're all so ignorant! Science has hardly made a start! Maybe some day there'll be such a thing as interdimensional traffic, but right now I can't imagine it. My utmost hope is that we can get the phenomenon to repeat a few times, so we may study it and get data.

"But thanks very much for Pinto. Nothing could help us more. I'll have to ask you to tie her in place. You'll have to remove a row of poles to get her in, then replace them. I'll help you. Let's do it right now. We all of us had better be getting ready for tonight."

He stopped the tests and asked for volunteers to oversee two tower installations of floodlights and remote-control stereo movie cameras; the physical work would be done by junior members of the staff. Older members of the staff would install the available apparatus around the danger area. While they did this, he, with Tom and me, would place the horse.

Tom went alone to fetch Pinto. Poles and cords were removed; Pinto was tied to one pole by her halter and to others by ropes tied around a pad placed on a hind leg; then the poles and cords were replaced. To my surprise Tom did not show any special feeling, he worked thoughtfully and said nothing; but before the cords were replaced, at a moment when the Chief and I were at a distance, I caught sight of him at Pinto's head, affectionately stroking her muzzle. It was decided, for Pinto's comfort, not to tie her head high just then; the Chief said he'd send someone to do it a little before the currents were turned on. When we were finished Tom and I accompanied the Chief on his inspection of the light and movie and instrument installations. By dusk everything was completed and checked, and all returned slowly and wearily around the field to the main building.

A simple buffet supper had been laid on the trestles. Tom and I were invited to eat with the scientists, but we felt in the way and took some sandwiches and containers of coffee to the top-floor lab and ate at the windows overlooking the field. Rather, I alone ate; Tom only drank the coffee, for he was depressed from the hope-destroying words of Doctor Chambers. Night had arrived. The moon, not quite round, lit the field clearly, showing the tall towers, the long black scars of the trenches, and the dark patch where the poles were set. Even through glasses we could not make out Pinto, standing tethered in their midst.

We watched for a long time, not saying a word, each trapped in the web of his own thoughts—Tom's as gloomy and bitter as you may imagine. Suddenly the two installed lights flooded the central area, and picking up our glasses we could trace the outline of Pinto. Just as suddenly the lights went out, leaving the field plunged into a deeper darkness. A few minutes passed in silence, then Tom said:

"Where's Herzog?"

"Down in one of the small labs on the floor below," I told him. "Working. That is, thinking. Filling papers with equations."

"Show me where it is," he demanded. "I want to see him."

I refused, saying it would be unpardonable to interrupt him at such a time—that he was hard at work, and that his time was uniquely important.

"Well, my seeing him is uniquely important to me," he retorted grimly. He threatened to find out from someone else, and it ended by my taking him there.

He knocked. After a moment Herzog's voice told us to come in.

IX

WE ENTERED a small, brightly lighted room. Dr. Herzog was sitting on a stool at a table, before him a page with several lines of scribbled pot-hooks, at his left a box of paper, and on the floor at his right a waste can half filled with crumpled sheets. He slid about as we entered and a slight smile parted the stubble of face and head.

"My midnight friends!" he exclaimed gently. "I've had no real chance to tell you how sorry I am that it was true about your wife," he said to Tom. "I didn't believe you. I thought you both were victims of an hallucination. It's probability .8, eh? I still can hardly believe it. You're upsetting the whole of modern physics, young man. Doctor Chambers has just told me you offered your horse. That's fine. We have to try and find out. We have to learn the secrets. We may have so little time. We're caught by surprise; we're not ready with proper experiments, we even lack vital equipment. The horse is ideal. Long neck, and head the height of a man's. We shall soon see." He stopped speaking and looked at us, waiting.

It put Tom on the spot. "We shouldn't be interrupting you, and I'm sorry; but Tom here insisted, and I couldn't prevent him."

Herzog looked at Tom questioningly. Tom said: "I—I was wondering—I was hoping that maybe now you could explain what happened to my wife."

Dr. Herzog sighed. "Have you forgotten my little lecture?"

"But you didn't believe us then, and since then the thing's happened again."

"I told you, I understand so little. I work, but we have so little data. We need far more. Data! We need data!"

"Well, excuse me, sir—I thought—you've been here all afternoon, and I thought you might have got some idea. . . ."

"Well, it's just possible there may be a tiny crack, if I could find the right wedge. I don't see why I shouldn't tell you. In the copy of my book you will see introduced somewhere about page seventeen a constant with the value 59.18. This morning when I saw the print of the field layout I noted that the central section of the field, bounded by three trenches and their carriers, made what looked like a perfect equilateral triangle; 60-degree angles in each corner. Now, 60 degrees is very near to 59.18. Of course the print was only a drawing; the actual angle on the field is something else; but it's interesting. What if the angle on the field is 59.18? Or what if the constant *should* be the angle on the field? There was no time to survey the triangle with high accuracy, but it will be done tomorrow. Meanwhile I've been probing here with symbols."

"And you haven't found anything?" Tom asked.

"No. But I have the feelings. You know about them? Certain vague feelings of being close to a success—tantalizing—frustrating, yet not quite unpleasant—a thing common at a certain stage of the creative process."

"Do you think you'll get it soon?"

"One always hopes. But I felt that way about a key section of the Field Theory eight years before I was able to resolve it!"

"Then you don't expect to understand, soon, what happened?"

"I've a motto: 'Always hope, never expect.' I hope. But there's so little data! We have almost nothing. As for understanding—in ten or a hundred years, after thousands or millions of experiments, men may be controlling the phenomenon, but that doesn't mean

they'll understand it. You'd better not hope at all."

I could see that each time Doctor Herzog spoke, Tom felt his words like a blow.

"I mustn't be impatient with you, young man, for you're distraught—and why shouldn't you be? Why shouldn't you wonder what happened! But you have to realize we're not magicians. In all probability our chances for obtaining data dwindle rapidly—and when will the phenomenon occur again? Consider. The two strokes occurred on nights 1 and 3. We are hopeful it will repeat this evening, on night 4, but that's only a hope. Since night 1, conditions in our part of the cosmos have changed greatly. The moon's in a different position relative to the sun; the Earth has moved 18.5 times 60 times 60 times 24 times 3 miles through space, and our solar system has moved a further amount. Matter, gravity, space, time—they interlock. That's not the word—there are no words for such things—but they comprise something like a Whole with various interoperating manifestations. Change one thing and all the others are affected. Put more accurately, with change of one manifestation all others change. Sneeze, and the cosmos is jolted. Nothing's ever the same again. We are part of one Field which contains everything or which is everything. The fatal activity in our little field, and the fateful forces of the cosmic Field—they change. And our understanding of the cosmic Field is something comparable to the microbe's understanding of calculus. Practically zero. I hope for more data tonight, and for many nights. I can't expect it. It could be that man will require generations to harness the forces detectable in the center of the field out there, and it may be that man will have to evolve through millions of years to understand them."

Tom was shattered. He mumbled:

"Then—you've still no idea where my wife is. I mean, what happened to her."

Doctor Herzog shook his head. "It was a new thing, and we lack data."

Tom just stood there.

"Let me tell you something, young man. You know about our finding the pieces of animal tissue?"

"Yes, sir."

"Several experts examined them this afternoon—a zoologist, a biologist, two paleontologists. They all say they're animal tissue, almost fresh, very recently torn off. They say they came from no animal now living on Earth. Do you get the implications of this?"

"I think so."

"The biologists call the things tentacles. They say they are full of nervous tissue, rather like the gray matter of the human brain. The paleontologists say that it's unlikely that any creature bearing such tentacles ever lived on Earth. Do you understand what this suggests?"

"The future," Tom murmured. "Or parallel worlds."

"Our ignorance!" Herzog exclaimed, and for a moment he sat in thought. "I told you my motto, but as always there's an exception. *Don't* hope to learn anything about your wife. Don't. It's unhealthy. It's insane! Face it: Your wife is gone. You'll never see her again. She's dead, only her body can't be seen. She's not out of the universe. Nothing can escape from the Whole. She's still part of it, in a new way. Part of the Field. Of which you and I at this moment are part, of which everybody and everything is part."

"Go away, now, and let me work. I assure you—I know it sounds impossible—but I assure you that gradually, in time, you'll get over this. All things change with time. Time is a factor in the Field. In

the Field you are still related to your wife. In it and through it you will some day have a new status with regard to her. Endure. For a while, just endure. This will pass. I promise you, even this will pass."

We left him, returning to the top-floor lab. Tom was completely broken now. I knew he'd been secretly hoping for a miracle, but I'd not realized how much. He looked out the window. Unseen out there under the moonlight, standing in the middle of that dark patch, waited patient old Pinto. On that spot his wife had been struck.

"Three days ago at this time Mary was alive," he murmured after a while. "Two days ago at this time the kitten was alive. Yesterday at this time Jerry and old man Williams were alive. I killed them all."

"You didn't kill any of them!" I objected.

"And I'm killing Pinto in a few minutes," he went on, heedless. "If I hadn't got sore at Mary I'd have kept her there a little, and walked her back myself, and maybe nothing would have happened, and if it did happen we'd both be together, at least. I killed the two others by not warning them. I killed the kitten because—oh, Jack, that was the worst of all!"

Surprised at this I asked, "Tell me about the kitten."

"I murdered it!"

"You can't murder a kitten," I said. "Maybe you killed it . . ."

"I killed it. I kill everything. Everything I touch has to die. Mary, the two fellows, the kitten, and now Pinto. But I'm consistent. I make it complete."

"Tell me about the kitten," I said, for I saw there was a deep wound there. I had to press him.

"The little kitten, a mere ball of fluff, hardly the weight of a handkerchief!" he cried in a rush of emotion. "I like kittens. Who can help liking a kitten! Mary'd picked it up somewhere, so skinny and tiny you couldn't tell when it was in your hand. Well, the night I came home from Herzog's I went in the house and looked around. I was full of bitterness and hate. I stood looking at Mary's apron on a chair, where she'd tossed it before coming to see me on Pinto. I looked at it about to burst. Then the kitten—the kitten came and rubbed against my shoes—and it kept coming—and—and I picked it up and choked it to death. That tiny innocent little bunch of fluff! I looked at it, warm and limp in my hand. The poor little thing, it didn't weigh more than a handkerchief, and I'd killed it. It trusted me; it was hungry; it was playing with my shoelaces, and I killed it with my hands. It was then I went crazy. I tore through the house. I hated myself. First Mary, then that funny, friendly kitten."

"Well, you shouldn't have done it," I said. "You should always be kind to animals. Everybody should be perfect." I changed my tone. "Look, Tom, it was only a kitten. It had hardly begun to live. It probably didn't suffer any more than if you'd stepped on its tail. It never knew what it was all about. It's simply not important. Forget it."

Slowly and earnestly Tom said, "If I could change places with that kitten, I'd do it. And with the two men, I'd do it. And if I thought they'd let me, I'd change places with Pinto out there . . ."

I must have been blind.

IX

TOM GREW silent and we sat looking out over the moonlit field. We saw a man go out and enter the patch, then return—someone sent to the Pinto's head in the high position. A time passed. Then down

stairs we heard the sound of many voices, followed by footsteps on the stairs. Someone flicked on the room lights and the group of scientists entered.

"Ah, here you are," said Doctor Chambers. "We were looking for you. It's time for the final briefing."

He sat on a high stool, and Herzog sat on another near him, while all the others gathered around.

He explained what each was to do. Hofkin was to be at the switches. Three men were to remain in that room and observe with glasses what might occur. All the others were to take stations at given intervals outside the fence of the field. If the horse's outline floated away, those nearest would try to follow it. One station seemed more important than the others because of the probability that the head would move in the direction taken by the previous ones; Doctor Herzog was assigned this. I was to be with him, because I knew the countryside. For the same reason Tom was to accompany Doctor Chambers—if he thought it would not be too distressing.

"It may be asking too much, Tom," the Chief said kindly. "Don't come if you'd rather not."

All eyes went to Tom. After a moment he stammered:

"I don't want to."

"We understand," the Chief said. "I don't think I'd want to go myself, in your place." He turned to the others. "That reminds me: We heard from the hospital. All room lights will be out. There'll be no panic."

He looked at his watch. "It's two minutes of nine. There's ample time to get to our stations, but none to fool around. Pick up a pair of binoculars, then get to your stations and wait. At 9:19:30, half a minute before minute zero, the floodlights will come on for just a second. That's the warning. At 9:19:55 the floodlights will come on to stay. Five seconds later, at 9:20, the currents will be cut in. They'll come in at the critical values. Adjust your glasses in advance. Keep focused on the head, and, if you can, follow it after it leaves the field. It's a pity we can't follow it with instruments—but at least we may see what becomes of it . . . All right, any questions? If not, let's go."

I joined Dr. Herzog and we started to leave. As I passed Tom the physicist smiled and said to him:

"We try to learn the secrets."

Tom looked at him with a strange expression, then looked the same way at me, not removing his eyes all the way to the door. That was our farewell. I never saw Tom alive again.

I led the way for Doctor Herzog and half a dozen other scientists. As we moved along the fence the others dropped out one by one, till we continued alone. We arrived at our station with nine minutes to spare, and carefully adjusted our glasses to the dark patch of poles. I could not make out Pinto.

As we waited I pointed out to Doctor Herzog the positions of those on the field at the moment the Unknown had struck Mary. There, close, in the same moonlight, was the trench where the two men had remained working. There I had stood, there Tom, and along there Mary had passed on her way to the place of mystery. Here was where Tom had gone up over the fence, and here I had fallen stunned. The head came straight toward us, and passed through the fence right there. The hospital and Big Pond were in that direction . . .

Doctor Herzog listened attentively but said very little. We waited, and it seemed a long time. Then suddenly the floodlights blinked. For a second the center of the field stood bathed in light, and the dark

patch in the center became a bunch of bristles. As we raised our binocular glasses all was dark again.

We waited, glasses ready. The passing seconds seemed minutes. Then, again suddenly, the floodlights came on. I held my breath.

From the patch of bristles came a thin c-r-a-c-k, and with it a white cloud—just as before. Through my glass I watched the cloud thin and disappear. A large irregular object appeared against the bristles—Pinto's head and a faint vapor-like outline of his body. It came a little sharper above, and darker below. It seemed to grow.

"It's on our side," I breathed.

Glasses up, we watched it. The head grew larger. It seemed to remain in the same spot, but it kept growing. That meant only one thing, I said:

"It's coming in our direction."

Doctor Herzog made no comment, but I could sense him tense beside me. We waited. Suddenly I cried out:

"No! Oh no, no, no!"

I'd seen something else, and in a flash I understood. There was another object behind the first one, a smaller object, previously occluded but now partly visible. The first was Pinto, but the other I still could not make out distinctly. But I knew! A sharp pain cut through my chest, and my heart seemed to stop beating. I cried out:

"It's Tom too!"

Dr. Herzog breathed in suddenly but said nothing. We watched. I cried:

"There's the bandagel!"

Everything around me seemed to disappear except the dreadful objects now coming toward us. Through



"From the patch of bristles came a thin c-r-a-c-k!"

indescribable emotions I saw them move outward from the lighted center, Pinto's head coming larger and larger, and just beyond it, a trifle to one side, the visible part of a smaller head, one with a bandage on the forehead, floating evenly at a constant distance in the same soft motion. With them were portions of poles and cord.

I let down my glasses. Eight feet or so in the air they came on, slowly and horizontally, a little to our left. They were opaque. Now they were only 30 feet away from us, and the moonlight showed them clearly. Pinto was facing away from us, tilted somewhat from the vertical position it would have in life; Tom was nearly upside down and pointed to our right, and his eyes were closed. They floated nearer, then passed one after the other through the fence. I heard Doctor Herzog gasp.

They passed us a dozen feet away and went straight across the narrow side road and the fence of the opposite field. I started after them, Doctor Herzog following. I squeezed through the fence and held the wires separated, to help him through, but he stumbled to a post and held tight to it and motioned me on. I saw he was panting, in physical distress; his heart wasn't adequate. He gasped:

"You go. You! Go on!"

I left him and chased after the two objects, coming up to them at the far side of the field. They passed among the trees. For a second I turned and saw Herzog still holding to the post, and two other men with him; then I followed Tom's and Pinto's outlines.

They passed between the trees and through them. Straight ahead and out the far side they went, smoothly, inexorably, rotating slowly and independently, Pinto in front, Tom several feet behind. They kept eight feet from the ground—a little more, a little less. When they came to a hollow in the ground they seemed to react to it, and lowered somewhat.

The two, with some fragments of poles and cord. Two that I knew so well. Pinto with her halter. Tom with the bandage on his forehead, the inevitable lock of red hair on the bandage. Pinto's eyes closed now, mouth moving a little. Tom's eyes now half open, but no expression under the iodine stains on his face.

They passed along the way of Mary. The way toward the edge of town, the way across the farm, the way which bore a million times their footprints—and Mary's too, and mine.

I followed at a fast walk, a little behind. I could have touched them; I thought of it, but didn't dare. I imagined my hand going through, and Tom, face turned toward the stars, eyes open, not showing that he was aware, but perhaps knowing what I did . . .

We came to a pond and they continued straight across, lowering a little over the surface. I ran around and caught up with them on the far side. We passed a farmhouse, quiet and lonely in the moonlight, a single window lighted. We passed the outbuildings—on, on to an unknown destination.

The hospital came into sight, and we passed the southern edge of its grounds. Were the mental patients still trembling at the unreality of the reality they had witnessed?

We passed the hospital.

I was out of breath now, and tired. I stumbled often. I got caught in barbed wire. I bled. Sometimes I spoke. I thought:

Tom! If you could speak! Can you see me? Can you know I'm following? Is your mind there?—or in some other, unimaginable place? Do you understand now? Can't you indicate it? But your eyes move!

Tom—you shouldn't have stolen back to Pinto! The pain would have passed! But the trenches were there, and it was so easy. . . .

Tom—are you aware you are with Pinto? Your old Pinto—your horse, your companion, for years inseparable—parts of one organism, almost—once galloping across this countryside—now again together, floating across this same countryside—companions once more on a last incomprehensible journey. . . .

Where are you going?

Say something, Tom! Talk to me, tell me what's happening. I saw your lips move! Where are you going? What are you feeling? Don't you know I'm here? It's Jack—your old friend . . . but your face is toward the moon, your eyes are now closed, and you float to a destination unknown and unimaginable.

See—this is your father's farm! Look, there was where we found the Indian bones! Can you remember that? Can you remember at all? Here's the house. No one lives here now, Tom. The kids have broken the windows, the braver ones have dared the ghosts and entered, and smashed what they found, and played roughly; but it's your house, you were born here, you grew up here, there's not an inch that has not known you as you ran eager on your important boys' business. Can you remember, wherever your mind is now?

To Tom's face came no sign that he knew I was there. But his eyes half opened. He floated past in another time and space. Still with Pinto.

They floated evenly in their straight transit, always rotating a little, passing the outbuildings and the meadow and nearing the pond. I followed despairingly.

Tom—here's where we tried to get the frogs to fight! No luck at it, none at all. They wouldn't fight, and they're long since dead, whatever that is, and now you're different too, Tom, floating so mystically over this crumb of the universe, once all yours, now so serenely abandoned. Here's the pond! Once white with ducks! Do you remember the boats?

The heads lowered as they crossed the water, and as before I ran around and caught up with them on the far side. Still straight ahead they floated. Through the trees, into the little clearing. . . .

Do you remember this place, Tom? The hours we fought here, and the many times we sat down to rest and cry? And how you came to me on Pinto and made me take a ride. I didn't want to take that ride. I was afraid. But you were doing such a favor; I had to do the one thing that would get you feeling square toward me again. So I rode Pinto—Pinto, do you remember it?—and I was so glad when I could get off. . . .

They floated eternally on, Pinto with her halter, Tom with his bruises and the iodine stains and the bandage on his forehead and the stubborn red lock on the bandage. I thought the heads looked thinner now; of thinner substance. There were moments I thought I could see through them.

Straight on they went, idly rotating, floating serenely through the moonlight. They came to the lake. By then I was exhausted.

I stood on the edge and watched. Gradually they lowered until they were just over the surface. Ghost-like, I thought I saw their entire bodies. I saw them touch the water, then ride evenly downward until they were gone. I watched for a long time, but I did not see them again. . . .

I thought, have you found Mary, Tom? Do you understand, now, what happened to her? Is she able to be happy? Is she surprised that you came with Pinto? Will you be together for a long time? +

science news shorts

astronomy

Mars

MARS, the red planet, has intrigued men for years, as a possible abode of life. For a long time it was thought that another race of men probably lived on Mars—men somewhat like those on Earth. But scientific studies of the Martian atmosphere have led to the latter-day deduction that while life may exist on Mars, it is probably of a far different type than man himself—probably a low form of animal organism. Some interesting facts on Mars appear in an article in the *Scientific American*, by Gérard de Vaucouleurs.

The white polar caps observed on Mars are possibly not thick snow and ice fields (as previously conjectured) but thin coverings of frost on very cold ground. These thin frozen water coverings which form during the cold season, under a cover of wintry mists, evaporate with the return of the sun's spring warmth. There seems little doubt (from recent studies) that the large yellowish areas observed on Mars are deserts.

As to the Martian atmosphere, a long search for oxygen made at the Mount Wilson Observatory failed to detect any trace of it. Also it contains no hydrogen or helium. It has been determined that Mars' atmosphere does contain carbon dioxide (about twice that in the Earth's atmosphere). It is now believed that Mars has less than one percent as much water as the Earth, and that most areas on Mars are extremely dry. Nitrogen possibly accounts for the bulk of the atmosphere. In addition to the carbon dioxide, we may add a small trace of the rare gas argon.

Winds on Mars probably range up to 60 miles per hour. Atmospheric pressure on Mars at ground level is about 65 mm of mercury (less than one-tenth of the Earth's sea-level pressure). As to climate, the mean Martian temperature lies somewhere between 80 and 40 degrees below zero Fahrenheit (much colder than the Earth's mean temperature of 60 degrees F.). At noon in summer the temperature on Mars (in the tropics) may reach 80 degrees F.

The variations in surface patterns seen on Mars are thought to be possibly due to vegetation growths. The argument over the Mars canals has raged for years. The canal-like markings observed have finally been noted to occupy the same positions as discovered by Schiaparelli three-quarters of a century ago, and the plant life on Mars, changing with the seasons, probably accounts for the canal-like markings. But they were apparently not made by intelligent beings resembling men, as often conjectured.

Speedy Planet

ICARUS, a tiny planet measuring about half a mile in diameter, will break a speed record for its extremely rapid motion in relation to the Earth in 1968, it is predicted. This event was announced

by Dr. Samuel Herrick, Jr., of the University of California to a Royal Astronomical Meeting held recently in London, England. Besides, the asteroid may serve as a critical astronomical check on the Einstein relativity theory. This check will be made by noting small changes in perihelion (point in the path of a planet which is nearest to the sun) motion due to the relativity effect. According to the relativity theory the perihelion point should shift a slight calculable amount, varying for each planet. The change for Icarus is much less (in 100 years) than it would be for Mercury (the previous astronomical check-mark), but the change can be measured about five times more accurately. Dr. Herrick and Dr. J. J. Gilvarry of the Rand Corporation, Santa Monica, Calif., made the calculations of the perihelion motion for Icarus, the only body, aside from a comet, which is known to pass within the orbit of Mercury. Icarus is calculated to approach within approximately 4,000,000 miles of the Earth in 1968, or about four times closer than any minor planet has yet been predicted to come.—*Science Service.*

atomics

Radioactive A-Dust Remover

AFTER an atomic bomb explosion, walls of a building and other surfaces remain coated with radioactive dust. It is important to scrub these surfaces with some effective detergent in order to protect public health. New detergent scouring compounds containing phosphorus have the property of collecting and holding rare Earth elements, which are among the most abundant fission products resulting from an atomic blast. So effective are these new detergent compounds that nearly 99 percent of the invisible but menacing radioactive particles are removed, according to tests reported by Dr. Foster D. Snell to the 26th International Congress of Industrial Chemistry. For cleaning plaster walls, water alone is better.—*Science Service.*

biology

The Character of Genes

GENES, those mysterious transmitters of such personal characteristics as the color of one's hair or eyes, may quite likely be segments of the string itself, instead of being beads on a chromosome string, as previously conceived. Such is the conclusion of Dr. Taylor Hinton, geneticist of the University of California at Los Angeles.

The classical bead concept seemed adequate a few years ago, but recent research indicates that the gene is more than likely a compound segment of a chromosome. Research with fruit flies shows that a gene can be divided into as many as five

parts and rearranged at distant intervals, each part of them being capable of functioning independently.

Previously, the gene was conceived to be a single large molecule responsible for a particular genetic characteristic, but the latest study suggests that some genes may be made up of a lot of molecules, all performing the same function or purpose. Our changing ideas about genes have arisen from a better understanding of mutations, Dr. Hinton suggests.—*University of California.*

Seeing in the Dark

How to see better in the dark has been a problem of great importance to military men. One method of adapting the eyes to see in the dark is to wear red goggles for half an hour ahead of time. The red goggles do not prevent a man from reading a map or checking an instrument. New experiments show that a better way to train the eyes for dark adaptation is to provide complete darkness for about 30 minutes. This discovery is the result of experiments reported by Dr. Walter R. Miles of the Psychological Laboratories, Yale University, to the Optical Society of America.

In the experiments both methods of dark adaptation were tested on the same persons at the same time. A red goggle was placed over one eye and an opaque shield over the other eye. The eye best adapted to see in the dark turned out to be the one from which all light had been blocked off. This need not affect the practice of wearing red goggles for improving the eyes for night vision (followed by men in the armed services), as this technique has been amply demonstrated to be effective in practice.—*Science Service.*

Protoplasmic Universes

ONE of the newest discoveries made with the aid of the powerful electron microscope is that suspensions of protoplasm resemble a miniature universe. This discovery was described in *Protoplasma*, published at the University of California at Los Angeles, by the late Dr. O. L. Sponsler and Dr. Jean Bath of the botany division of the University. When a collection of protoplasmic bodies are viewed under the electron microscope, they are observed to bear a striking likeness to photos of heavenly bodies taken through powerful astronomical telescopes. The study of these protoplasm groupings by Dr. Sponsler suggested that the larger bodies in living protoplasm may attract smaller ones in some manner, thus making it possible for systems to form which are very similar to the universe's planetary ones.

When closely examined, the very minute particles, probably highly organized mechanisms or enzyme complexes, appear to possess an internal structure.

So it is that science in its constant explorations, has come up with information that is as startling and imaginative as anything in science-fiction. A good writer could work up a novel story from the material given.—*University of California.*

Super-Electronic Brain

If a man were asked to memorize the approximately one million bits of information in five solid pages of a newspaper, he would find it impossible, especially if he had to do it quickly. But a new *electronic brain* recently described by Dr. Jan A. Rajchman of the Radio Corporation of America, Laboratory division, has a fast-acting device that can *memorize* information in a fraction of a second and recall the stored data at a moment's notice. It can store this information indefinitely and if a hundred of these new machines were connected together, the complete unit could easily store the one million pieces of information mentioned previously. The new brain utilizes 10,000 tiny ring-shaped magnets arranged in a wire network; the minute currents passing through the circuits magnetizes the ring magnets in proper order and permits at most as 10,000 pieces of information to be stored in an instant.

Another electronic brain perfected at the Argonne National Laboratory is said to be much faster than previous models of such computers. Some idea of its astonishing capacity can be obtained from the fact that it can receive, retain, and process 2,048 12-digit decimal numbers; it can *memorize* four million words, and it is capable of multiplying 999,999,999,999 by 999,999,999,999 faster than one can blink an eyelid. The wonder computer is to be installed at Oak Ridge this fall to help solve the mathematical problems met with at that plant.—*Science Service.*

Death from Radar

The postwar development of *microwaves*, particularly for *radar*, has brought about entirely new problems in so far as human health is concerned.

It appears that with greater powers soon to be in use, operational risks to personnel in the vicinity of microwave transmitters may become a cause for concern, states Hugo Gernsback, Editor of *RADIO-ELECTRONICS* in his *Editorial* appearing in the August issue of that magazine.

Recently, Sidney I. Brody, Commander (MC) U.S. Navy, stated that in the past, power output of airborne radar equipment has been moderate. It did not present any particular hazard to those exposed to the radiations. But present-day radar beams represent peak pulsed power of a million watts or over, as compared to the 45,000 watts of a decade ago.

Commander Brody observed that the two frequency spectra, the "S" or 10-centimeter and the "X" or 3-centimeter bands, are now in current use. He stated that the effect on living organisms of the various frequencies of electromagnetic waves in these bands are thought to be essentially *thermal* in nature. It is not known so far whether there might be *other than heat effects* when living organisms are exposed to these radiations.

It has been noted that the 3-centimeter radiations used today in radar equipment can produce high thermal effects. The subject receives ample warning due to the high heat generated on the surface of the skin. Therefore the 3-centimeter radiations do not seem to constitute a hazard for the exposed personnel. However, on frequencies in the vicinity of 10-centimeters, the conditions change because the high temperatures in this case occur about

1 centimeter below the surface in organs not cooled by the blood stream. Since the skin is not stimulated by this heat the subject does not perceive heat nor pain—he no longer has any warning. Therefore, the 10-centimeter radiations become dangerous.

Rabbits exposed to constant power in a 3,000-watt field for 75 seconds were killed, while a 30-second exposure produced death in 2 minutes. Instant death to a rat resulted after only 22 seconds irradiation at that power, and 10 seconds of a 4,000-watt constant power output killed a hamster soon after exposure. High increases in body temperature produced heat paralysis of the respiratory centers.

One of the most important hazards, particularly for humans, is the production of cataracts following exposure to high-power microwave radiations.

A spectacular illustration of the power output of radar equipment was conducted by Lockheed Aircraft Corporation. Dry steel wool in the radar beam was ignited at a distance of 100 feet. At 70 feet an explosion was produced by aluminum chips in a gasoline vapor-air mixture. Photoflash bulbs were fired at a distance of 523 feet. Individuals who have metal bone implants or metal plates covering a cranial defect may suffer dangerous burns when under high power radiations. Excessive heat may possibly be produced in metals carried by the individual working near these rays.

A very ingenious and simple safeguard has been proposed recently for radar maintenance personnel. Because neon gas tubes light up brilliantly in the presence of microwave radiations, they can be readily placed on the under surface of the men's cap visors. When the small neon tube flashes on an immediate and effective warning of dangerous exposure is given.

New "Memory" Storing Crystals

Two hundred and fifty bits of information can be stored indefinitely in a new flat crystal measuring but half an inch square. The crystals, only a few thousandths of an inch thick, have been developed by scientists connected with the Bell Telephone Laboratories.

The crystals are artificially grown from the chemical barium titanate. A few square inches of such *memory-storing* crystals are equal to many cubic feet of currently used computing devices, and they may have a profound significance in decreasing the space occupied by telephone switching systems.

The new Bell Laboratories memory crystals store their information in the binary code, consisting of only two symbols designated by either a "yes" or a "no." Words, sentences, or a series of numbers can be coded by using a large number of these symbols, similar to the punched pattern in the player-piano roll, which can represent a piece of music.

Coded information is fed into the crystals by the simple application of a plus or minus voltage, depending on whether a yes or no is desired. No man-made storehouse has thus far even remotely approached the compact perfection of the human brain. These remarkable new memory-storing crystals represent a distinct step forward in the science of miniaturization.

It has been estimated, as a matter of interest, that an artificial brain (even to approximate imperfectly) roughly equivalent to the capacity of the human brain would require a space the size of Grand Central Station (in New York City) to house the thousands of vacuum tubes, re-

lays, capacitors, and associated equipment.—Bell Telephone Laboratories News.

food chemistry

Cobalt-60 Makes Pork Safe

PORK, when undercooked or raw, has been a dangerous food because of the trichina worm parasites which may infest it. Now, thanks to investigations by Drs. H. J. Gombert and S. E. Gould at the University of Michigan (Ann Arbor), pork can be freed of any trichina worms by subjecting it to gamma rays from radioactive cobalt-60.

An exposure of meat to 20,000 roentgens of cobalt-60 irradiation prevents any larval trichina worms present from maturing. This treatment of the pork or other meat prevents the parasite from growing and reproducing its kind in humans who eat pork.

This is a very welcome and important discovery, as it has been estimated that the trichina parasite possibly has been responsible for infecting about 18 percent of the population of the United States with *trichinosis*, the disease resulting from eating infected pork. Other remedial measures to protect the pork-consuming public have been to cook the meat for 15 minutes for each pound, or quick-freezing it at very low temperatures. The U.S. Government specifications call for all uncooked pork products to be stored for 20 days at 15 degrees below zero Centigrade (zero degrees C. is freezing) in order to properly control trichina worms.—*Science Service.*

Algae To Feed World

TOMORROW, the world's population may depend on a new source of food—cultivated algae. This is forecast by Dr. Vannevar Bush, president of the Carnegie Institution of Washington, D. C. Algae can utilize sunshine and air more efficiently than can any other living or mechanical process.

The algae can supply high-protein food, which the world will need most in the future. Large-scale production or culture of algae may well become a prime industry if the world's food supply starts to fail.

The first large-scale use of cultivated algae as human food occurred in Venezuela some ten years ago, when lepers were successfully fed soup made from algae. Seaweed, which are large-sized algae, have been eaten by oriental people for hundreds of years. Among the 17,000 different species of algae, scientists are confident that some suitable ones will be found that can be efficiently used as high-protein food.

Algae can produce a continuous crop, regardless of weather or seasonal changes. The cell structure is such that they are practically all food, without the usual waste we have from stems, roots, and leaves of higher plants. It is planned to construct a demonstration algae-growing plant, covering about an acre, as soon as some of the experimental problems have been solved.—*Science Service.*

geology

"Microquakes"

MICROQUAKES are tiny imitation earthquakes set up by a pulsating lithium

sulfate crystal for laboratory study of earthquake phenomena. The tiny tremors so produced are being used by Drs. Leon Knopoff and Glenn Brown of the Institute of Geophysics on the Los Angeles campus of the University of California.

Another phase of this study of Earth tremors on a laboratory scale is that connected with the location of petroleum deposits, and the nature of the Earth's interior. This controlled production of seismic tremors is expected to provide a clearer insight as to the nature of the transmission of seismic waves through the earth.

Microquake waves are sent through granite, wax, or cement blocks from the pulsating lithium sulfate crystal, at a frequency of 1,000 per second or more. An oscillograph and photo-recorder traps the shock waves after transmission through the laboratory test blocks, so that they can be minutely studied and analyzed later. The seismic waves present the best method of exploring the Earth's interior, according to Dr. Knopoff, and this laboratory study should provide a much improved seismic prospecting technique, as well as a more efficient method of interpreting seismographic data.—*Science Service*.

Glaciers Grow Again

DO GLACIERS ever grow? It seems that they do, according to a recent report on Norwegian glaciers. For the first time in twenty years it has been observed that snow-covered Norwegian glaciers are slowly moving forward. Two glacial branches have shown a substantial increase in ice volume during the past two years, states the Norwegian glacier expert, Mr. Olav Liestol.

Whether these increases indicate a climatic change it is too early to determine, said Mr. Liestol. Glaciers in Norway, in general, have shrunk (about 50% in total areas) rather than increased in the past fifty years. One glacier (the Nigardsbreen branch of the Jostedal glacier) has shrunk more than 300 feet vertically and has receded 2 3/4 of a mile between 1937 to 1951. While the Storöen glacier in Jotunheimen shrank steadily up to 1951, it has reversed the process and has shown an increase in ice volume since that time.—*Science News Letter*.

geophysics

The Earth—A Dynamo

THE LIQUID CORE of the Earth may act as the armature of a huge dynamo, in which gigantic electric currents are generated, which in turn serve to magnetize the Earth's shell. Such is the newest theory proposed by Dr. Edward C. Bullard, head of Britain's National Physical Laboratory.

The Earth-dynamo theory, states Dr. Bullard, would clarify the problem of why there has been only a slight if any, diminution in the Earth's magnetic field. This hypothesis would also account for the fact that compass variations from true north change irregularly from one location to another.

The theory that the Earth's liquid core may act as a dynamo may be difficult to prove by experiment, as stated by Dr. Bullard, but it possibly can be proved by mathematical analysis. It is conjectured that the core of the Earth acts like an armature in a dynamo, through the movement of a conductor (the core) within a magnetic field (the whole Earth). The

electricity thus generated is presumed to react on the metal core and cause it, as well as the surface of the Earth, to become magnetized.

It has been estimated that a current of 5 billion amperes would be sufficient to maintain the Earth's present magnetic field.—*The New York Times*.

inventions

3-D Microscope

THREE dimensional views of microscope specimens are now possible, thanks to the inventions of Roy Pence of the entomology department of the University of California. He has devised a simple, inexpensive method of producing 3-D images of microscopic specimens. This technique uses a single view-type camera mounted in a fixed position.

To obtain the desired three-dimension effect, two pictures are taken at the same time from an angle. The specimen stage is tilted to give the desired angles, the degree of tilt approximating the eight degrees of normal visual convergence of the eye for close work. A special iris diaphragm provides great focal depth.

When the two pictures are viewed through an ordinary stereoscopic viewer, a marked three-dimensional effect is obtained. It is also possible to use slides so made in 3-D still-screen projection. The new 3-D microscope technique is said to be especially useful in the lower magnification range.—*University of California*.

medicine

Brain Cells Kept Alive

BRAIN nerve cells, when deprived of oxygen, need not die, according to recent discoveries reported by Doctors C. M. Pomerat, C. George Lefebvre, and McDonald Smith of the University of Texas medical branch at Galveston, Texas. There is hope of restoring afflicted minds, these experiments tend to prove. Movies of a growth cone emanating from a nerve cell in the human brain cortex showed life after the brain tissue would ordinarily have been dead.

The cells photographed were those maintained in special fluids that served to keep them alive. Dr. Pomerat found that some brain cells had an extraordinary capacity for repair and we should not think that every brain nerve cell dies in a few minutes, just because the brain is deprived of oxygen. These successful experiments in keeping a number of brain cells alive (which ordinarily would have died) justifies the hope that in the near future scientists may discover a way to revive brain cells. These studies may also reveal how different chemicals affect nerve cells and provide a method for improved treatment of mental and nervous diseases.—*Science Service*.

Fetal X-Rays

ONE of the latest developments in medical science is *amniography*, in which an opacifying fluid is injected into the amniotic fluid in the fetal sac of pregnant women, permitting X-rays of the fetus and sac. Such X-ray examination will show, for instance, whether the fetus is alive or dead; the condition and placement of the placenta (after-birth); abnormalities of

the fetus; possible presence of uterine tumors; possibly the sex of the fetus; deformities of the birth passage, etc.

No harm to mother or fetus (unborn child) has been noted in the experiments so far conducted. Although amniography has been used in early pregnancies, it has more recently been employed in general clinical practice in the last three months of pregnancy.—*Radiology*.

physics

Cosmic Rays Constant

THE atomic processes of Nature are far more constant than the best man-made devices. So constant is the high-energy bombardment of the Earth by cosmic rays from outer space that it has probably not varied more than 10 to 20 percent during the past 35,000 years!

This is the opinion expressed by Drs. J. Laurence Kulp and Herbert L. Voldhak of Columbia University's Lamont Geological Laboratory. Their deductions were based in part on the new method of radioactive carbon dating.

For the last 4,000 years measurements made by use of carbon-14 have shown a very good check with known historical dates. For checking older ages, use was made of the carbon-14 value of layers of mud found in deep sea core samples, which corresponded satisfactorily with age-checks found by the radioactivity of ionium method. The radioactive carbon geological check-up is afforded by the fact that cosmic rays in the upper atmosphere convert nitrogen atoms into radioactive carbon, which has an approximate life of 8,000 years.—*Physical Review*.

Spot Travels Faster Than Light

THE SPEED of light (approximately 186,000 miles per second) has been surpassed by a spot of light moving across a cathode-ray tube, at the unbelievable velocity of 202,000 miles a second! A Naval research engineer and his associates photographed this flashing spot of light, in seeming contradiction of the Einstein theory.

However, the fast-moving light spot measured by Harold J. Peake and his group of scientists had no weight. The velocity they measured was a "phase" of "writing" velocity. The writing velocity exceeding the speed of light was the result of a signal voltage applied to the cathode-ray tube, which was changing at the rate of 5,000,000 volts in 1/1,000,000 of a second. Mr. Peake calculated the speed of the moving spot of light at 13,000 inches in 1/1,000,000 of a second. The high-speed spot was recorded on a device known as a "time microscope."—*New York World-Telegram and Sun*.

spatialogy

Photons for Rocket Power

THE "spaceship" (or a high-altitude rocket) of tomorrow may utilize a stream of photons (light particles) as a propellant—and achieve a speed close to that of light! (186,000 miles per second). This startling prediction was ventured recently by Dr. Eugen Saenger and his wife Dr. Irene Saenger-Bredt of Paris, at a technical meeting of the International Astronautical Federation in Zurich, Switzerland.

One of the theories advanced was that

the rocket (or a spaceship) speed might be increased by using fuel combinations of hydrogen and fluorine or atomic hydrogen. Dr. Saenger-Bredt expressed the opinion that super speeds might eventually be attained more efficiently by utilizing a nuclear-energy source of fuel. It was assumed that the photon-propelled rocket (or a spaceship) would operate most effectively when outside the atmosphere of the Earth (or that of other planets).—*The New York Times*.

Doubt Spaceship's Nearness

BEFORE a spaceship can take off from the Earth there are a number of technical problems to be solved, as was pointed out by several speakers at a recent meeting of the International Astronautical Federation in Zurich, Switzerland. Milton W. Rosen and Richard W. Snodgrass (of the U.S. Naval Research Laboratory in Washington) are reported to have stated that they thought space-flying (escape from the Earth) was not feasible yet, and that the most promising task for the near future was the construction of an Earth satellite.

A fundamental error in rocket design and operation, they stressed, is the idea or assumption that the propellant mechanism will function according to theoretical calculation. So far, the rockets fail to burn all the fuel and thus fail to reach the calculated altitude. New fuel-mixture ratio controls are necessary to overcome this fault.

Marcel J. E. Golay of the U.S. Signal Corps Engineering Laboratories at Fort Monmouth, N. J., described new radio contact plans necessary between space-flier crews and the Earth, using, possibly, signals having a frequency as high as 300 megacycles. A signal-space plotting network would be desirable, which might require twenty or more Earth stations, about six of which would maintain radio contact with the space-flier, to guard against failure of communication. The various radio stations would transfer contact successively with the rocket or space-flier as the Earth rotates. This would call for fine synchronization with a "central" radio station, where the radio signals and messages from the spaceship would be collected and cleared.

New High-Altitude Rocket

THE newest method of sending exploratory rockets to great altitudes calls for launching them from a high-flying piloted (or pilotless) airplane. This technique was devised by Dr. S. F. Singer of the

Government's Office of Naval Research.

The rocket could be fired in any desired direction. Such a rocket would carry scientific instruments for measuring and recording air pressures, sound velocities (by the aid of grenades exploded at high altitudes), temperatures, daily and seasonal variations of winds, ozone measurements, etc. It should also be possible with such high-flying rockets, to measure the high-altitude currents in the auroral zone when the Earth's magnetic field fluctuates wildly, causing radio and cable communication to be severely affected.

Furthermore, it may become possible with such rockets to determine or record the softness or hardness of X-rays emanating from the sun. Rockets for these high-altitude measurements need to ascend to heights of 270,000 feet or more. The measurements of variations in the ozone layer would be of great value to meteorologists and physicists.—*The New York Times*.

"Hell Roarer"

BRIGHT ELASIES of light in the sky over Windsor Locks, Connecticut, caused many people to phone the police with reports of seeing flying saucers (or else planes apparently in flames). The bright flashes were caused by experimental tests of the "Hell Roarer," a powerful magnesium flare which lasts for more than 4 minutes. It is used by the U.S. Air Force to take night photographs of enemy activity by special cameras mounted in high-speed planes. The powdered magnesium is contained in a torpedo-like cylinder 12 feet long, which is mounted on the wing of the airplane.

It takes its name, "Hell Roarer," from the noise it makes when in operation. Scientists at Wesleyan University, Middletown, Conn., developed the brilliant flare for the Air Force. The new flare yields a light equivalent to approximately 10 million candlepower.—*Science Service*.



Bird Music

THE human ear is wonderfully sensitive to a certain range of sounds, but it is no match for the intricate sounds constituting many bird songs. Using an electronic device which reveals the pitch and timing of the songbird's every chirp, Professors Donald J. Borror and Carl R. Reese, ornithologists at the Ohio State

University, have discovered that the songbird's simple melodies are not as simple as we may sometimes think.

The audio spectrograph revealed, for example, that one blue-jay sang almost a major chord, starting with a high and a low note simultaneously, then inserting a middle note a hundredth of a second later. A wood thrush sang four notes simultaneously. Another discovery was that different birds of the same species have their own separate repertoires.

The concept that a bird's song is not merely a simple, involuntary call and actually may represent either a definite form of artistic expression or a pattern of communication is thought-provoking enough to warrant further investigation. Scientific teams should be set up to electronically record thousands of "songs" from various birds and see if there is any definite pattern of repetition or what relationship the various "songs" have to the situation the bird may be in at the time.

It is unfortunate, but nevertheless true, that while many forms of life on this planet show definite signs of intelligent behavior, and even of culture, no really strong attempt has been made to find how they communicate, or whether a simple signal system takes the place of articulate speech. Insects, such as the ants, are particularly worthy of careful study and research in this regard.—*Science Service*.

Fastest Heart Beat

THE heart of the long-tailed shrew beats at the unbelievable rate of 500 to 1,300 times a minute, faster than any other animal's. Drs. Peter R. Morrison, Fred Ryser, and Albert R. Dawe, zoologists of the University of Wisconsin, made the measurements of the rates of the shrew's respiration and heart beat. The shrew breathes about 800 times per minute, compared to 15 times (average) a minute for man, whose heart beat averages 72 times a minute.

The larger the mammal, the slower the heart beat, generally speaking. For example, the mouse has a heart beat rate of 620 to 700 per minute; new-born human, 120 to 140 per minute; elephant, 24 to 53 per minute; beluga whale, 12 to 23 per minute. Small birds like canaries and humming birds have shown heart-beat rates of about 1,000 per minute. The heart-beat rate for cold-blooded animals is slower, that of a tortoise, for instance, being about 10 to 20 times a minute and that of the frog about 30 times per minute.—*Science Service*.

Hot Detector

THE University of California pulled a new one out of their scientific hat the other day—an arctic instrument that detects humans by their body heat.

In case of an invasion in the Arctic area, the army has been searching for ways in which its men can fight efficiently in the intense cold. To that effect the Government has been conducting experiments in the North for some time. This new heat detector is a direct outgrowth of these experiments.

The instrument works by collecting reflected heat and setting off a voltage change in a metal coil from the heat of a nearby body. Because of thick fogs and heavy snowstorms in the North, a soldier can stand hidden a few feet from his enemy. But not when the heat detector is used. It can spot a man 100 feet away solely by his body heat!—*B. W. Felt, Alameda, Calif.*



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fiction

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book reviews

Word Magic

DWELLERS IN THE MIRAGE and THE FACE IN THE ABYSS, by A. Merritt. Liveright Publishing Corp., N. Y., 1953. 638 pages. \$2.75.

One of the unquestioned titans of fantasy fiction was A. Merritt. His mastery was evidenced most strongly in his tales which may be defined loosely as science-fantasies, stories which have some basis in scientific fact, but which would not qualify under any tight definition of science-fiction.



A. Merritt

Merritt was a young newspaper reporter specializing in covering crimes of violence and death; an innocently involved figure in political manipulation who was forced to flee the country and spend years roaming Central America; and the eventual editor of Hearst's *American Weekly*. Merritt saw life at its grimmest, most sordid level. It is likely, that his writing of beautiful fantasies about wondrous, imaginative happenings, related in a style of exquisite beauty and appeal, and leavened by pronounced elements of humanity, was his form of escape from harsh reality. Millions of readers have accepted his avenue of temporary release from their daily problems, and made him one of the most applauded fantasy writers in history.

The two novels in this volume represent Merritt at the very peak of his ability. *The Dwellers in the Mirage* is almost a perfect example of his artistry. Although concessions are made to scientific plausibility, the story weaves an effective web of fantasy against a background of lost civilizations. The characterization is excellent, and the struggle between the dual personalities of the hero might be simply broken down to the struggle between good and evil, except that Merritt understands that there are no black and white absolutes in such things, and points this up with poignancy and power.

The Face in the Abyss also includes the novel, *The Snake Mother*. The Snake Mother is the last remaining member of a part-human, part-reptilian race that once inhabited the Earth and is the final repository of an ancient culture's wisdom and invention, including advanced atomic knowledge. This tale, too, is told in the human terms which bring Merritt's most far-fetched notions to life. The character portrayal of the Snake Mother is particularly memorable.

Donald A. Wellheim, in concluding his introduction to this volume, has called these two fantasies "great." Reading them for what they are, I am inclined to go along with him.

The Gospel

SCIENCE-FICTION HANDBOOK, by L. Sprague de Camp. Hermitage House, N. Y., 1953. 328 pages. \$3.50.

Obviously, this volume is the fifth in a series of books aimed to comprise a pro-

fessional library for science-fiction writers, much in the manner of that possessed by doctors, lawyers, and other professional groups. Actually, while it does give much valuable information on the art of writing science-fiction, its greatest fascination lies in the fact that it is probably the most informative and delightfully entertaining book on the general field of science-fiction yet published.

The volume is divided into definite sections. There is a scholarly chapter on the high points of the origins of science-fiction, followed by another chapter on the modern development of the genre; there is also a chapter on the markets and editors in the field; another on readers and fans; still another on leading writers; and naturally the essential chapters on how to do it.

The errors to be found in the volume are of a minor nature. On the whole a great deal of research is obvious in the wealth of fascinating detail presented. The author evidences that he has culled out items which he feels will be of paramount interest to the readers, and with reluctance held back a wealth of other fascinating data he has at his fingertips, some of which is alluded to in his valuable "Notes" and "Bibliography" at the end of the book. There is a handy index appended.

De Camp has long been noted for the sprightly style with which he writes his articles, and this talent is evidenced here, for this book can be read through by the science-fiction reader for sheer entertainment.

It seems inconceivable that science-fiction readers and even members of the literary minded public will not find this book as interesting as the writers, and to the latter it is probably the lightest form of good instruction they will have received in some time. Highly recommended.

Mutants

CHILDREN OF THE ATOM, by Wilmar Shiras. Gnome Press, Inc., N. Y., 1953. 216 pages. \$2.75.

The superman theme in literature goes back to Samson in the Bible and the Norse gods in ancient mythology. In most cases, the concept of a superman implied great strength or extraordinary physical ability. In the old days, such a concept was justified, for physical strength represented the final authority. In modern times, the idea of the superman has come to imply mental superiority, since physical strength alone cannot suffice in today's more complex civilization. In science-fiction the term "mutant" has been applied to characters in stories that are born with some form of mental superiority.

Slan, by A. E. van Vogt, is one of the most well-known and popular novels of mutations, dealing with the great problems mutants would have in gaining acceptance by the mass of ordinary human beings who might regard their superiority as a threat to their freedom. John Taine in his powerful novel, *Seeds of Life*, concentrated on a mental superman who was predominantly interested in using his powers for scientific experiment and

achievement. Stanley G. Weinbaum, in *The New Adam*, posed the question of a mental superman hopelessly in love with a "normal" girl and of the problem of his physical and mental incompatibility with her. Earlier in the century, British novelist J. D. Beresford wrote an adroit and entertaining novel entitled *The Hampdenshire Wonder*, dealing with a child in a small English town who was a brilliant mental mutant and the difficulties attendant to schooling and raising him in the "ordinary" fashion.

This present volume, *Children of the Atom*, is closest akin to the *Hampdenshire Wonder*, inasmuch as it deals with a brilliant group of mutated children, but has elements of *Slan* incorporated, as these children, aware of their exceptional endowment, make every effort to conceal their difference from the rest of the population. The best chapter in the book deals with the processes whereby a psychiatrist discovers the special qualities of one of these children.

The emphasis in this volume is placed on the efforts of the mutated children to adapt themselves to their fellows without causing difficulty or arousing enmity.

Within its limits this is a successful and entertaining book. The first three stories have previously seen magazine publication, but new ones have been added and appear here for the first time.

BOOKS RECEIVED

A GUIDE TO THE MOON, by Patrick Moore. W. W. Norton & Company, Inc., N. Y., 1953. 248 pages. \$3.95.

AHEAD OF TIME, by Henry Kuttner. Ballantine Books, N. Y., 1953. 177 pages. 35¢.

BALLROOM OF THE SKIES, by John D. Macdonald. Greenberg Publishers, N. Y., 1953. 296 pages. \$2.75.

FLIGHT INTO YESTERDAY, by Charles J. Harness. Bourey & Curt, Inc., N. Y., 1953. 256 pages. \$2.75.

ONCE UPON A STAR, by Kendall Foster Crossen. Henry Holt, N. Y., 1953. 237 pages. \$2.95.

OUR NEIGHBORING WORLDS, by V. A. Fraser. M.A. Philosophical Library, Inc., N. Y., 1953. 326 pages. \$6.00.

PRIZE SCIENCE FICTION, edited by Donald A. Wellheim. The McBride Co., N. Y., 1953. 230 pages. \$3.00.

SCIENCE-FICTION ADVENTURES IN DIMENSION, edited by Groff Canklin. Vanguard Press, N. Y., 1953. 354 pages. \$2.95.

SECOND STAGE LENSEN, by Edward E. Smith. F.D. Fantasy Press, Reading, 1953. 354 pages. \$2.95.

SPACE SERVICE, edited by Andre Norton. World Publishing Co., Cleveland, 1953. 377 pages. \$2.50.

THE MYSTERY OF OTHER WORLDS REVEALED. Sterling Publishing Co., N. Y., 1953. 144 pages. \$2.95. Nonfiction.

THE SECRET MASTERS, by Gerald Kersh. Ballantine Books, N. Y., 1953. 226 pages. 35¢.

THE UNDYING FIRE, by Fletcher Pratt. Ballantine Books, N. Y., 1953. 148 pages. 35¢.

THE WORLD OF PRIMITIVE MAN, by Paul Radin. Henry Schuman, N. Y., 1953. 370 pages. \$3.00.

WEST OF THE SUN, by Edgar Pangborn. Doubleday & Co., Inc., N. Y., 1953. 219 pages. \$2.75.

WORLD OUT OF MIND, by J. T. McIntosh. Doubleday & Company, Inc., Garden City, N. Y., 1953. 227 pages. \$2.95.

LOST CIVILIZATIONS, by H. Rider Haggard. Dover Publications, N. Y., 1953. 769 pages. \$3.95.

THE END OF THE WORLD, by Kenneth Nease. Rinehart & Co., N. Y., 1953. 220 pages. \$3.00.

KILLER COME, by Sam Mervin. J.R. Abelard Press, N. Y., 1953. 254 pages. \$2.75.

Science Questions and Answers

A Matter of Dimensions

Editor:

Is there anything like a Klein bottle? What is its shape and purpose?

Samuel D'Orazio, Jr.
Philadelphia, Pa.

Answer:

The Klein bottle represents a theoretical concept of how a one-dimensional object—that is, a straight line—might look if it could be warped into three dimensions.

If you define one dimension as "length or a straight line with no thickness," then the moment the line is bent it becomes two-dimensional. But, as there is no such thing as a straight line, (even light doesn't travel in a straight line), you have reason to hold that there is no true standard for straight in the universe except as a mathematical concept. And, as you don't have anything straight to start with, nothing can be warped from straight, but can only be warped further than it already is.

But, mathematicians like to conjure with such problems and have come up with a number of stunts to illustrate the problem of defining dimensions. One of these is the *mobius* which is shown here.



A MOBIUS

A one-sided surface, formed by holding one end, AB, of a rectangle, ABCD, fixed and giving the paper one twist before pasting the ends together as indicated above.

With a pencil trace a line continuously on the surface. You will find that it comes back to the starting point, without turning corners which would make it a two-dimensional object. The *mobius* represents a one-dimensional line "warped" into a two-dimensional figure.

Now, see the solid figure here. It has only one surface and only one edge, even though it is three-dimensional, which, it shouldn't be from the ordinary definitions for surface and edge. Start any place along the surface and trace a line, or trace along an edge. The top becomes the inside, bottom, and outside. When you get back to the starting point your pencil will have negotiated the perimeter of the solid. So you have a solid with one plane and one edge.

The Klein bottle is somewhat similar. Many models have been made from glass or clear plastic. You can trace a line around the object to come back to the starting point and in doing so you can pass from the outside to the inside of the figure and back again.

There are four-dimensional tricks also, the *tesseract*, for example, which makes two cubes look like six cubes. For additional information, we recommend that you examine books at your public library dealing with mathematical oddities, or see George Gamov's *1-2-3-Infinity*. For a Klein bottle see illustration for *The Dimensional Terror* in the June issue.

—Editor.

More About the Integral Nature of Atomic Weights

Editor:

Concerning the letter from J. Arico, which you printed in your August issue, perhaps the following comments may be of interest:

The integral nature of many of the atomic weights was noticed over a hundred years ago, and it was suspected by many chemists that more accurate work would reveal that all were integral. This led to some of the most accurate analyses of the past century, which definitely showed that chlorine and many others were definitely not integral multiples of the weight of hydrogen. However, early in this century it was shown mathematically that the probability that as many of the atomic weights should be integral as are, by pure chance was something less than one in a thousand. This stimulated further speculation and with the discovery of isotopes by Aston, it was thought that now all atomic weights of the separate isotopes would become integral.

Further study, however, showed this was not true, and the deviation of atomic weights from integral multiples of that of hydrogen was termed the "mass defect." A graph of mass defect against atomic number shows that hydrogen is high on one side and uranium on the other, with the transition elements—iron, cobalt, nickel—at the bottom.

As a matter of fact, when hydrogen forms helium (and other elements) the "mass defect" or loss of mass is converted to energy, and it is precisely this reaction which accounts for the sun's energy, and is also the reaction utilized in the hydrogen bomb. In the case of the uranium or plutonium atomic bomb the same sort of effect is utilized, the products of the nuclear reaction having a smaller "packing fraction" than the reactants, and thus releasing energy according to the well-known equation $E=mc^2$, where "m" is the difference of mass between the reactants and products, usually a fraction of 1 percent of the mass involved but still very great when we consider that "c" is the velocity of light in cm/sec. (3×10^{10}).

So we see that, if all the atomic weights had been integral, we should not have the possibility of atomic energy!

Gustav Albrecht
Altadena, Calif.

Comment:

Our compliments to Dr. Albrecht for additional, clear elucidation. We reproduce his letter in its entirety.

It is only a guess that the sun's heat is due to the energy change resulting from the conversion of hydrogen to helium. The resultant energy of such a conversion would be greater than for any other atomic transmutation so far considered possible. This is what makes the prospect of a hydrogen bomb so fascinating to scientists, aside from its potential military value.

Whether or not the hydrogen bomb was tested recently is a detail still clothed in secrecy. But it has been conjectured that lithium fission may be involved in an attempt to produce the high temperatures thought necessary. When an atom of lithium is bombarded with protons it splits

into two atoms of helium and produces more energy than any known element, weight for weight; about twice that possible from uranium 235. It is conjectural, also, whether Ex-President Truman alluded to the hydrogen bomb or to the possibility of annihilation of all matter with simultaneous conversion into energy, when he hinted at the terrific potentials which scientists had attained.

—Editor.

A Correction?

Editor:

An error appears in your August issue, Science Questions and Answers Department. Carbon doesn't have an atomic weight of 16 thousand but 16,000.

Dave McCall
Iowa City, Iowa

Answer:

You found an error, all right, but didn't call it correctly. It is oxygen which has an atomic weight of 16,000, not 16,000, as given. Somehow a comma was inadvertently substituted for a decimal point. But, as all other atomic weights were correctly listed, we feel sure the point was not missed (sic) except by a few sharp-eyed persons like yourself. For your records: carbon has an atomic weight of 12.010.

—Editor.

The Classic Tree Problem

Editor:

Here is a problem to which I would like a scientific answer. A tree is 15 feet tall. It has a branch 6 feet from the ground. Years later the tree has grown to 45 feet. How much further is the branch from the ground? Would a rose-bush fastened in a normal way to a wire fence lift the fence from the ground by growth alone?

Miss Mary Esposito
Brooklyn, N. Y.

Answer:

It depends on how you make your measurements. If you measure from a fixed spot on the ground to the center of the branch, the distance remains the same, provided there has been neither soil erosion to drop the level nor an increase in land height because of accumulation. But, as the diameter of the branch increases with the growth of the tree, the clearance from ground to branch will be less than it was before. On the other hand, if you set a distance of a certain number of feet from the trunk of the tree, for establishing the position from which the vertical distance is to be measured, then the change in height will depend on the angle of the branches, as well as in the diameters, angles to the trunk. A couple of simple sketches will show you that you are measuring further along the hypotenuse of the angle as the diameter of the trunk increases. Just remember that plant growth takes place at the terminal ends of the branches, as well as in the diameters. Any mark—for example, a nail driven into the side of the trunk—will remain at the same distance to the ground regardless of how tall the tree grows.

No, the rose bush will not lift the fence—for the same reasons.

—Editor.

SCIENCE-FICTION around the world

Science-fiction magazines have been predominantly an American phenomenon—a product of this country's highly technological civilization. However, the modern advances of science have been so tremendous, as to make a powerful impact upon even the most conservative countries. The consequence has been that the people of the world are much more inclined now to place credence in the speculations of science-fiction than at any other time in history. On this page are reproduced the covers of science-fiction magazines from Holland, Italy, Mexico, England, Scotland and Australia. According to late reports, science-fiction magazines have already been contemplated or in the process of appearing in many other nations. As the world progresses, science-fiction will become universal.



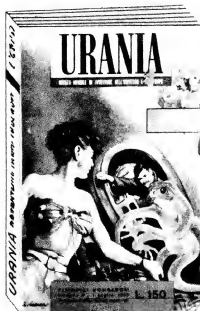
Scotland: *Nebula* is a bulky, 120-page, larger-than-digest size magazine, featuring a complete novel and short stories in every issue, in addition to departments of every variety. The material, except for an occasional short reprint, is new. At present the periodical is published every quarter.



Australia: *Thrills, Incorporated* was the first attempt at an Australian science-fiction periodical. Its slant was predominantly juvenile adventure. It went through considerable changes of size, format and pages and has temporarily suspended, though there is a possibility of its revival.



Mexico: *Los Cuentos Fantasticos* has produced well over forty issues depending for its content upon stories indiscriminately reprinted from American Magazines and books. Most of its covers are copied from American periodicals. However, in recent issues attempts have been made to develop Mexican talent in both fiction and illustrating. There are usually 40 pulp-size pages, readable typography, and no departments.



Italy: *Urania* is probably the most pretentious of all foreign science-fiction periodicals. Most of its fiction is reprinted from American sources and is of good quality. There is a substantial section of popular scientific articles. All the illustrations are new and are well done. The Magazine is hand-

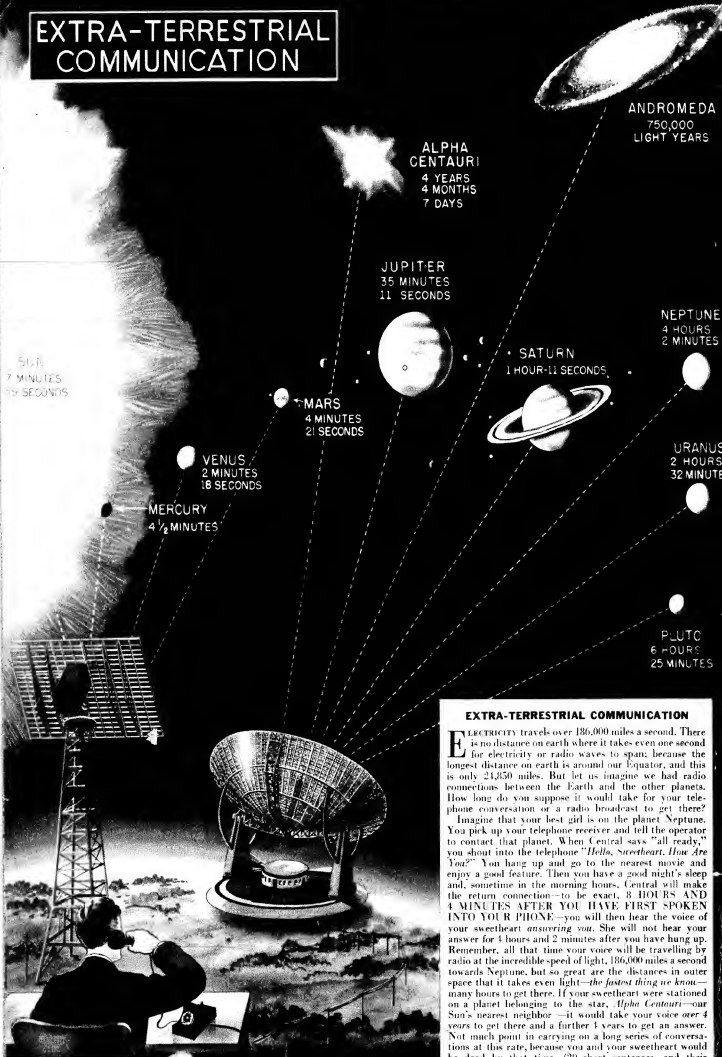


England: *Science-Fantasy* was originally started by Walter Gillings, who edited the first British science-fiction magazine *Tales of Wonder*. It is now under the directorship of John Carnell, who also publishes *New Worlds*. The two magazines, now digest-size, 120 pages, maintain a good level of quality, publishing original material and illustrations. An-



Holland: *Planet* is the second serious attempt at a science-fiction magazine in the land of the dikes, an earlier attempt failing after three issues. This is a 96-page, digest-size publication, which, at the start, is reprinting material from British science-fiction magazines. The illustrations are new, and in addition to the stories there are book and film reviews.

EXTRA-TERRESTRIAL COMMUNICATION



SUN
7 MINUTES
14 SECONDS

MERCURY
4 1/2 MINUTES

VENUS
2 MINUTES
18 SECONDS

MARS
4 MINUTES
21 SECONDS

JUPITER
35 MINUTES
11 SECONDS

ALPHA
CENTAURI
4 YEARS
4 MONTHS
7 DAYS

SATURN
1 HOUR-11 SECONDS

NEPTUNE
4 HOURS
2 MINUTES

URANUS
2 HOURS
32 MINUTE

PLUTO
6 HOURS
25 MINUTES

ANDROMEDA
750,000
LIGHT YEARS

EXTRA-TERRESTRIAL COMMUNICATION

ELECTRICITY travels over 186,000 miles a second. There is no distance on earth where it takes even one second for electricity or radio waves to span; because the longest distance on earth is around our Equator, and this is only 24,850 miles. But let us imagine we had radio connections between the Earth and the other planets. How long do you suppose it would take for your telephone conversation or a radio broadcast to get there?

Imagine that your best girl is on the planet Neptune. You pick up your telephone receiver and tell the operator to contact that planet. When Central says "all ready," you shout into the telephone "Hello, sweetheart. How Are You?" You hang up and go to the nearest movie and enjoy a good feature. Then you have a good night's sleep and, sometime in the morning hours, Central will make the return connection—to be exact, 8 HOURS AND 4 MINUTES AFTER YOU HAVE FIRST SPOKEN INTO YOUR PHONE—you will then hear the voice of your sweetheart answering you. She will not hear your answer for 4 hours and 2 minutes after you have hung up. Remember, all that time your voice will be travelling by radio at the incredible speed of light, 186,000 miles a second towards Neptune, but so great are the distances in outer space that it takes even light—the fastest thing we know—many hours to get there. If your sweetheart were stationed on a planet belonging to the star, Alpha Centauri—our Sun's nearest neighbor—it would take your voice over 4 years to get there and a further 4 years to get an answer. Not much point in carrying on a long series of conversations at this rate, because you and your sweetheart would be dead by that time. (20 short sentences, and their